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SYSTEM INTERFACE: USERS GUIDE FOR
THE VPF (VERTICAL PROCESSING
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N. Okonski
GSE & FACILITIES ELECTRICAL SYSTEMS
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Nicki Okonski 9-17-93

M. Shannonhouse
GSE & FACILITIES ELECTRICAL SYSTEMS
MDSS-F144

M. Shannonhouse SEPT 17, 1993

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ABBREVIATIONS AND ACRONYMS

A	ampere
AES	advanced electrical schematic
ac	alternating current
amps	amperes
ARS	antenna repeater system
AWG	American Wire Gauge
BHP	bulkhead plate
BNC	bayonet Neill Concelman
bps	bits per second
CCAFS	Cape Canaveral Air Force Station
CCMS	Checkout, Control, and Monitor Subsystem (LPS)
CDSC	Communications Distribution and Switching Center
cur	current
dB	decibel
dc	direct current
DDL	data downlink (from spacecraft)
DoD	Department of Defense
DUL	data uplink (towards spacecraft)
EIA	Electronic Industries Association
EMEC	electromagnetic effects compatibility
EMI	electromagnetic interference
ESA	Engineering Support Area
ESA	Engineering Support Assembly
ESA-60	Explosive Safety Area
F	Fahrenheit
FOSA	Flight Operations Support Annex
FSS	fixed service structure
ft	foot or feet
GFE	government furnished equipment
GHz	gigahertz
G-MIL	Goddard-Merritt Island (STDN Station)
GSE	ground support equipment

ABBREVIATIONS AND ACRONYMS (cont.)

HIM	hardware interface module
HPF	Horizontal Processing Facility
Hz	hertz
ICD	Interface Control Document
Kb/s	kilobits per second
KSC	Kennedy Space Center
LC	launch complex
LCC	Launch Control Center
LIVIS	Lightning Induced Voltage Instrumentation System
LPS	Launch Processing System
max	maximum
MILA	Merritt Island Launch Area
MHz	megahertz
MLP	Mobile Launch Platform
MON	Monitor
NASA	National Aeronautics and Space Administration
NRZ	Non-return to zero
NSTS	NASA Space Transportation System
O&C	Operations and Checkout (Building)
OIS	operational intercom system
OPF	Orbiter Processing Facility
P-P	peak-to-peak
PAM	Payload Assist Module
PCR	Payload Changeout Room
PHSF	Payload Hazardous Servicing Facility
PIP	Payload Integration Plan
POCC	Payload Operations Control Center
PPF	Payload Processing Facility
PTCR	Pad Terminal Connection Room
pwr	power

ABBREVIATIONS AND ACRONYMS (cont.)

Rd	round
ref	reference
resis	resistance
rf	radio frequency
RSS	Rotating Service Structure
SAEF-2	Spacecraft Assembly and Encapsulation Facility No. 2
seg	segment
SID	Standard Interface Document
SIP	Standard Interface Panel
SSP	Space Shuttle Program
std	standard
STDN	Space Tracking and Data Network
STS	Space Transportation System
TD	Terminal Distributor
T-0	time zero (ignition)
TSM	tail service mast
UPS	uninterruptable power supply
V	volt, voltage
VAB	Vehicle Assembly Building
Vac	Volts, alternating current
Vdc	volts, direct current
VPF	Vertical Processing Facility
WB	wideband
WBDL	wideband downlink
WBUL	wideband uplink

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to:

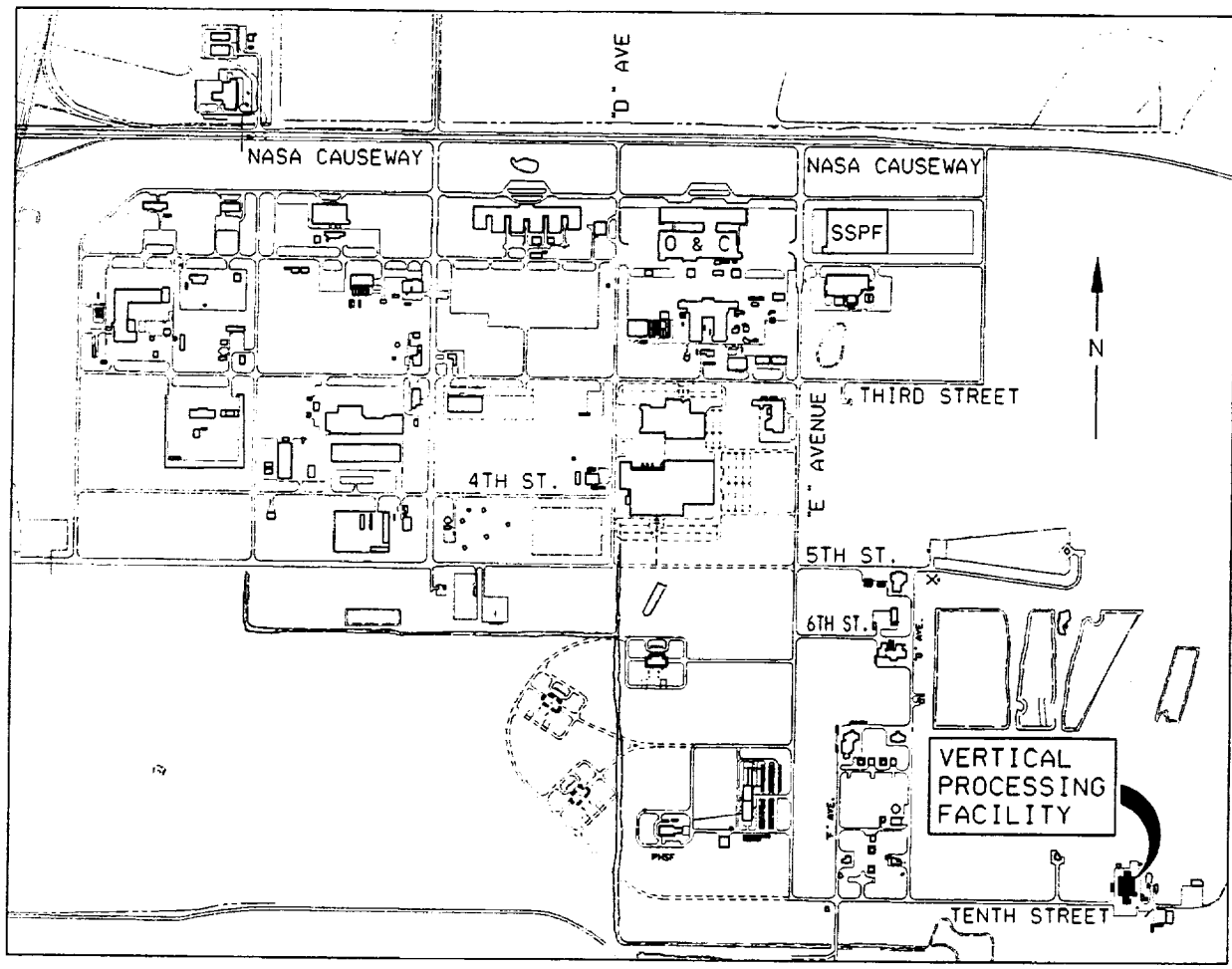
- a. Describe the simulated Payload and Ground Support Equipment (GSE) Data System Interface, which is also known as the payload T-0 (T-Zero) System. This simulated system is located with the Cargo Integration Test Equipment (CITE) in the Vertical Processing Facility (VPF) that is located in the KSC Industrial Area (Figures 1.1-1). The actual Payload T-0 System consists of the Orbiter, Mobile Launch Platforms (MLPs), and Launch Complex (LC) 39A and B. This is referred to as the Pad Payload T-0 System (Refer to KSC-DL-116 for Pad Payload T-0 System description).
- b. Provide information to the payload customer of differences between this simulated system and the actual system.
- c. Provide a reference guide of the VPF Payload T-0 System for both KSC and payload customer personnel.

1.2 SCOPE

This users guide provides the location, and configuration of the hardware and facilities available to the payload customer. It also identifies the differences between the VPF Payload T-0 System and the Pad Payload T-0 System.

1.3 CRITERION

The information in this Users Guide is for the conditions found at the Vertical Processing Facility, which matches or simulates the Payload/GSE/Data Interface Systems, located at Launch Complex 39, Pads A and B. The rule will be to "Design Ground Support Equipment" to meet requirements at Launch Complex 39 Pads A and B, Ref KSC-DL-116, Payload/GSE/Data Interface System Users Guide for Launch Complex 39 A/B.



KSC INDUSTRIAL AREA MAP
SCALE: NONE

FIGURE 1.1-1 KSC INDUSTRIAL AREA MAP

1.4 APPLICABLE DOCUMENTS

The following references were used for researching and publishing this guide or are referenced in it:

- Advanced Electrical Schematic, Basic Configuration 79K21696
- Checkout, Control, and Monitor Subsystems, User Packages, ESA, KSC-LPS-OP-033-12, November 1990
- Command, Control, and Monitor Subsystems, System User Packages, (Package 1), KSC-LPS-OP-003-1, July 1990
- Documentation Format and Preparation Guidelines, KSC-STA-02.02, NASA Space Station Project Office, June 1987
- Electric GSE Fabrication, Specification for, KSC-STD-165C, April 1982
- John F. Kennedy Space Center, NASA Bonding and Grounding Standard for, KSC-STD-E-0012-A
- Interface Control Document (A) (ICD), 2-19001, Shuttle Orbiter/Cargo Standard Interfaces, May 1988
- Launch Processing System User Manual, Vol II, KSC-LPS-OP-033-2, May 1988
- Payload/GSE/Data System Interface Users Guide for Launch Complex 39 A/B, KSC-DL-116 (Revision D), May 1992
- Standard Interface Document (79K16210) for Vertical Processing Facility
- Standard for Electrical Power Receptacles and Plugs, KSC-STD-E0011F
- System Operations and Maintenance Manual, KSC-DL-152, Vol. 6

1.4 APPLICABLE DOCUMENTS (Continued)

- Fabrication T-0 Umbilical VPF CITE Payload and GSE Systems
79K28873 REV D
- Installation T-0 Umbilical VPF CITE Payload and GSE Systems
79K28874 REV C
- O&M T-0 Umbilical VPF CITE Payload and GSE Systems 79K28875
REV C

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2.0 SYSTEM DESCRIPTION

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2.1 OVERVIEW

A unique feature that exists currently only in the VPF is that there are two tests cells (East and West). The two cells are independent of each other for many but not all systems. The T-0 systems located at the VPF are nearly 100% independent of each other for operations. The area which requires the most coordination is space allocation for the payload users GSE.

The T-0 systems in the VPF is located both inside the Hibay and in room 104. Like the Pad T-0 system, the VPF T-0 system provides an electrical interface capability to payloads independent of other Orbiter systems. (Ref Figure 2.1-1)

Although the VPF T-0 system is located with the CITE hardware, use of CITE hardware is not mandatory in order to use the VPF T-0 system. In fact because there is only one set of CITE avionics, in some cases, one of the T-0 systems may be the only interfaces available when the rest of the CITE is not.

The VPF T-0 system was designed to simulate the Pad T-0 system. However, due to many restrictions, several differences exist. Attempts were made that when deviations were required that the VPF T-0 system would not allow a potential problem to go undiscovered.

The VPF T-0 system provides simulation of all of the Pad-to-Orbiter Umbilical interfaces. The identification, class and quantity of interfaces available are as follow:

Orbiter Umbilical ID	Circuit Class	Quantity
J55	HO	25 Circuits
J58	HO	25 Circuits
J59	RF, Twinex	25 Circuits
J67	ML	15 Circuits
J69	ML	15 Circuits
J72	RF Coax	4 Circuits
J73	RF Coax	4 Circuits
J74	HO	6 Circuits
EASY-PATCH (1)	HO	12 Circuits

- (1) Easy Patch circuits are created from and are a subset of the J55, J58, and J74 circuits. Only 6 Easy-Path circuits exist at the VPF.

Table 2.1-1 ORBITER PAYLOAD UMBILICAL

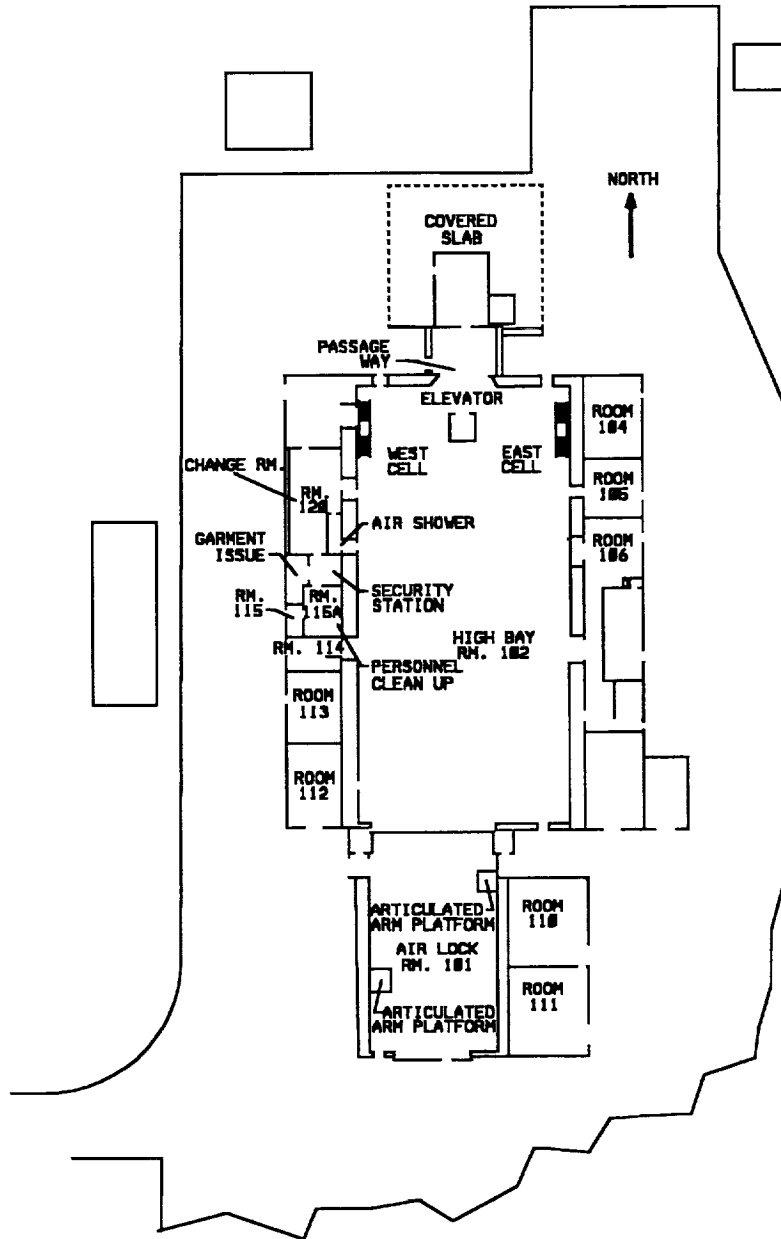


FIGURE 2.1-1 VERTICAL PROCESSING FACILITY, FLOOR PLAN

2.1 OVERVIEW (Continued)

The VPF T-0 system is a cable plant that provides the interface between the payload located in the VPF Hibay and the payload GSE, KSC communication networks and/or the Launch Process System (LPS) (Figures 2.1-2A and 2.1-2B) provide an abbreviated schematic of VPF T-0 system umbilical circuits.

The Pad T-0 system issued for payload test, checkout and maintenance in preparation for launch as well as communication during the final launch countdown. The VPF T-0 can only be used in preparation for Launch or simulation of final launch countdown communications.

GSE may be placed in either the MLP or Payload Terminal Connection Room (PTCR) at the Pad. Connection interfaces are identical between the MLP and the PTCR. Because of this only the MLP interface is directly simulated at the VPF.

Voltage, current and resistance specifications applicable to the Pad T-0 system are documented in the Orbiter/Payload Interface Control Document ICD-2-19001. The VPF T-0 system voltage and current specifications are identical, but the resistance specifications differ. The specifications are as follows:

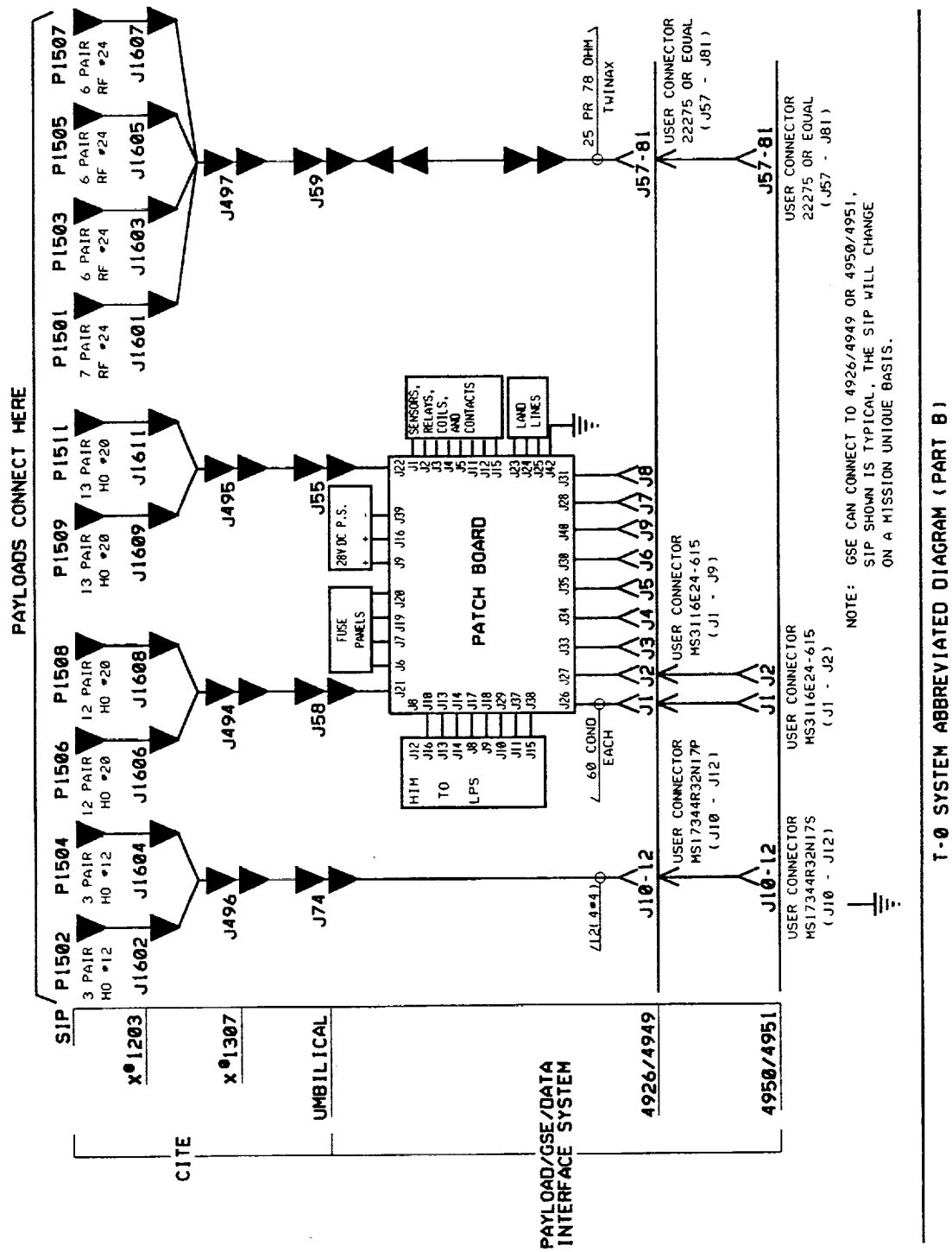
UMBILICAL ID	MAX VOLT (VDC)	MAX CUR. (AMPS)	MAX RESIS. (3) (OHMS)
J55 & 58	100	6	8.1
J59 (1)	100	1	15.7
J67 & J69 (1)	100	6	9.2
J74	100	22	1.9
Easy-Patch (2)	100	6	TBD

- (1) Resistance for tip and ring only.
- (2) Reference figures 2.1-1 and 2.1-2 for typical easy patch wire path.
- (3) Resistances are round trip from payload interface to GSE interface.

Table 2.1-2 T-0 Wiring Characteristics



2-5



2.2 KSC COMMUNICATION NETWORK INTERFACE

The Pad T-0 System provides an interface to the following systems for payload communication to other facilities at KSC as well as off-site:

- Wideband System (Analog/Digital)
- Narrowband System (Data/Control)
- Payload Antenna Repeater System

The VPF T-0 provides an interface to each of these systems.

2.2.1. WIDEBAND SYSTEM

The wideband system is a directional, conditioned transmission system with different digital or analog circuit types. The wideband system is accessed from the CITE Stand through the Spacelab/Payload Command and Data System (SPCDS). A total of nineteen circuits (twinax) are available. The following interface specifications are applicable to the wideband system:

Circuit Type	Frequency Range Or Bit Rate Range	Peak To Peak Voltage
Analog (RS-170)	30 Hz - 4.5 MHz	1V +/- 0.2Vp-p
Digital (RS-422)	100 Bps - 256 Kbps NRZ 50 Bps - 128 Kbps Biphase	6V +/- 2 Vp-p 6V +/- 2 Vp-p
Input Impedance	124-ohm balance	

Table 2.2.1-1 Wideband Specifications (124 ohm balanced input)

2.2.2 NARROWBAND SYSTEM

The narrowband system is comprised of non-directional, 22-gauge, solid conductor, copper paths (standard telephone distribution cable). Any data transmission equipment (modems, etc.) or other signal conditioning must be provided by the user. This system provides access to telephone switching equipment for off-site data transmission. When used for control purposes, such as relay closure, the current source should be located at the relay location. The following interface specifications are applicable for using the narrowband system:

VOLTAGE	< 48 v dC (0 V ac)
AMPERAGE	< 20 milliamps.

The narrowband system is accessed from either PTCR 220 or MLP 10A at the Pad. At the VPF, it is accessed from room 104. For the Pad, a total of 180 circuits (pairs) are available from PTCR 220 and 60 circuits (pairs) are available from MLP 10A. But at the VPF, only 180 circuits (pairs) are available, all from room 104.

2.2.3 PAYLOAD ANTENNA REPEATER SYSTEM.

The payload antenna repeater system (ARS) is a passive microwave transmission system. Any signal conditioning equipment must be provided by the user. Refer to KSC-HB-0004.0 "Payload Antenna Repeater System User Guide," for further details.

At the Pad, an S-band (1.7 to 2.3 GHz) interface is available at all GSE interface locations (except PTCR 221). Higher frequency bands can only be accessed from level 3 of the PCR.

At the VPF, all frequencies can be accessed from either the 0 foot level floor) or the 35 foot level.

2.2.4 OPTIONAL SERVICE

Generally, the KSC communication support as described in sections 2.2. is an optional service.

2.3 LAUNCH PROCESSING SYSTEM

The Launch Processing System provides the capability to remotely command and monitor the payload or payload GSE functions from the firing room at the pad or from the CITE control rooms at the Operations and checkout building (O&C). The LPS is accessed via a mission-configured patchboard and LPS Hardware Interface Modules (HIMs). Both the Patchboard and the HIMs are located at the GSE interface at the VPF.

2.3 LAUNCH PROCESSING SYSTEM (Continued)

All payload J55 and J58 circuits can be patched to the LPS. Additional GSE commanding and monitoring capability exists from the GSE Interface.

The LPS frequently requires KSC provided supporting software and is generally an optional service.

2.4 GSE DESIGN GUIDELINES

All GSE that is planned to be used with the T-0 System should be designed for use at the Pad. An extensive effort has been put forward to keep the VPF T-0 System as similar to the Pad T-0 System as possible. The following subsections provide several guidelines that should be adhered to when planning the GSE. Additional information is provided in Appendix B - GSE Design Lessons Learned.

2.4.1 SIGNAL CONDITIONING

The T-0 Systems are strictly passive cable plants. As such, the user GSE must incorporate the necessary signal conditioning (amplification, impedance matching, etc.) to properly interface to the payload and KSC communication systems. Typical Pad T-0 System performance data is provided in Appendix C. A limited quantity of passive impedance matching devices are available in the T-0 System.

2.4.2 USER INTERFACE CABLES

The payload user must provide necessary cabling to connect to the T-0 Systems interfaces. The cabling must connect directly to the system-provided interface point. The interface connectors at the VPF are identical to those needed at the Pad.

Any breakout of multi-circuit system connectors required by the user are the responsibility of the user as part of the GSE/cable design. In the case of a multi-circuit breakout to serve multiple users, KSC will provide the breakout between the system connector and each user. The connector presented to each user will be identical to the system connector.

Drawing 79K28875, "Operations and Maintenance" (O&M) provides detailed schematic pinouts of the VPF T-0 system cabling. Additionally, The Mission Unique Drawings (MUDs) provide a detailed schematic of the end-to-end payload-to-GSE configuration. The MUDs show only those circuits to be utilized for the individual mission or payload, while the O&M shows the full system available.

2.4.3 BATTERY CHARGING

If battery charging will be required, the user must provide the GSE to be used as the current source. Four of the T-0 interfaces (J55, J58, J74 and/or Easy-Patch, Reference paragraph 2.1) can be used for battery charging. The T-0 interface to be utilized will be jointly determined between the user, KSC and JSC.

2.4.4 SHIELDING AND GROUNDING

GSE shall conform to the shielding and grounding of the circuit being interfaced within the Payload/GSE Data System Interface.

Cables and wire bundles are separated into four classes for shielding and grounding and are rated by voltage. The T-0 System uses three of the four classes: ML, RF, and HO. The classes are detailed in Table 2.4.4-1 and in O&M 79K28875.

When present, the GSE return busses and grounds must be separated for each of the following signal types:

- AC power return bus
- DC power return bus
- Signal return (common reference, or low side)
- Ground bus for single point ground circuits, and
- Shield return for single point ground circuits.

Ground busses shall be isolated by a DC resistance of at least 10.0 megaohms from each other and from all chassis, ground surface, and connector shells prior to making a connection to the intended grounding circuit.

Shield returns, except for RF shields, must not carry any signal current. In the case of balanced differential circuits, each side of the circuit must be balanced to ground by no less than 4.0 kilo-ohms. The T-0 System cabling provides a conductor-to-shield isolation of greater than 1.0 megaohms and a shield-to-ground isolation of greater than 0.1 megaohms (100 k). All GSE shall have provisions for connecting to the facility ground system. KSC-STD-E-0012, shall be used as a Reference Document, this document describes the KSC Facility Ground System.

Signal Frequency (Hz) or Rise/Fall Time (msec)	Source Impedance (Ohms)	Load Impedance (Ohms)	Min Voltage or Sensitivity *(Volts)	Max Voltage or Sensitivity *(Volts)	Circuit Classification	Wire Type Required	Shield Grounding Requirements
Analog Alternating or DC	<100	100-600K	100 mv	6	ML	TWS	SPG
Analog Alternating or DC	<100	0-200	6	40	HO	TW	None
Analog Alternating or DC	<100	0-200	40	-	EO	TW	None
Analog Alternating or DC	<2.5K	100-600K	-	100mv	ML	TWS	SPG
Analog Alternating or DC	<2.5K	>600K	-	100mv	ML	TWDS	SPG
Analog Alternating or DC	<100	>200	100 mv	6	ML	TWS	SPG
Analog Alternating or DC	<100	>200	6	40	HO	TW	None
Analog Alternating or DC	<100	>200	40	-	EO	TW	None
Below 50 KHz or Rise/Fall Above 10 msec	<100	>10K	-	6	ML	TWS	SPG
Below 50 KHz or Rise/Fall Above 10 msec	<100	0-200	6	40	HO	TW	None
Below 50 KHz or Rise/Fall Above 10 msec	<100	0-200	40	-	EO	TW	None
Below 50 KHz or Rise/Fall Above 10 msec	<2.5K	100-600K	-	100mv	ML	TWS	SPG
Below 50 KHz or Rise/Fall Above 10 msec	<2.5K	>600K	-	100mv	ML	TWDS	SPG
Below 50 KHz or Rise/Fall Above 10 msec	>200	>200	100mv	6	ML	TWS	SPG
Below 50 KHz or Rise/Fall Above 10 msec	>200	>200	6	40	HO	TW	None
Below 50 KHz or Rise/Fall Above 10 msec	>200	>200	40	-	EO	TW	None
Above 50 KHz or Rise/Fall Below 10 msec	ALL	ALL	-	100mv	RF	TWDS	MPG
Above 50 KHz or Rise/Fall Below 10 msec	ALL	ALL	100mv	6	RF	TWS	MPG
Above 50 KHz or Rise/Fall Below 10 msec	ALL	<1000	6	-	RF	TWS	MPG
Above 50 KHz or Rise/Fall Below 10 msec	ALL	>1000	6	-	RF	TWDS	MPG
Above 1.024 MHz	ALL	ALL	ALL	ALL	RF	COAX	MPG
TV Video					RF	TWS	MPG

SYMBOLS:

XHz -Kilohertz

mv -Millivolts

SPG -Single Point Ground

MPG -Multiple Point Ground

TWDS -Twisted Double Shielded

* If the capacitance per foot is critical, controlled-impedance wiring, special shielded-twisted-pair cables (nominal 75 ohms), should be used.** If the circuit is balanced by a transformer, differential or optical, the shield shall be multi-point grounded to structure.

RF -Radio Frequency

TWS -Twisted Shielded

AF -Audio Frequency

TW -Twisted

<-less than

≤-less than or equal to

>-greater than

≥-greater than or equal to

Table 2.4.4-1 Circuit EMEC Classification

2.4.5 PACKAGING

All GSE, with the exception of GSE that is planned to be used in the MLP, must be self-contained and self-supporting within its own frame or enclosure with appropriate handling fixtures for placement. For 19.00 inch and 24.00 inch racks Reference EIA Standard RS-310-B, Fig. 2.4.5-1 and Fig. 2.4.5-2.

GSE that is planned for use in the MLP should be hand-portable, and rack-mountable. Government Furnished Equipment (GFE) racks are provided at both the MLP and the VPF. All GSE to be used in the MLP should also plan to use the GFE racks for support. GSE that is too large to be physically secured to the floor in the MLP due to vibration encountered during launch. Securing to the floor is not required in the VPF.

2.5 CONSTRAINTS

The following constraints are applicable to the Launch Complex, Pads 39A and B.
Note: See Section 1.4 Criterion.

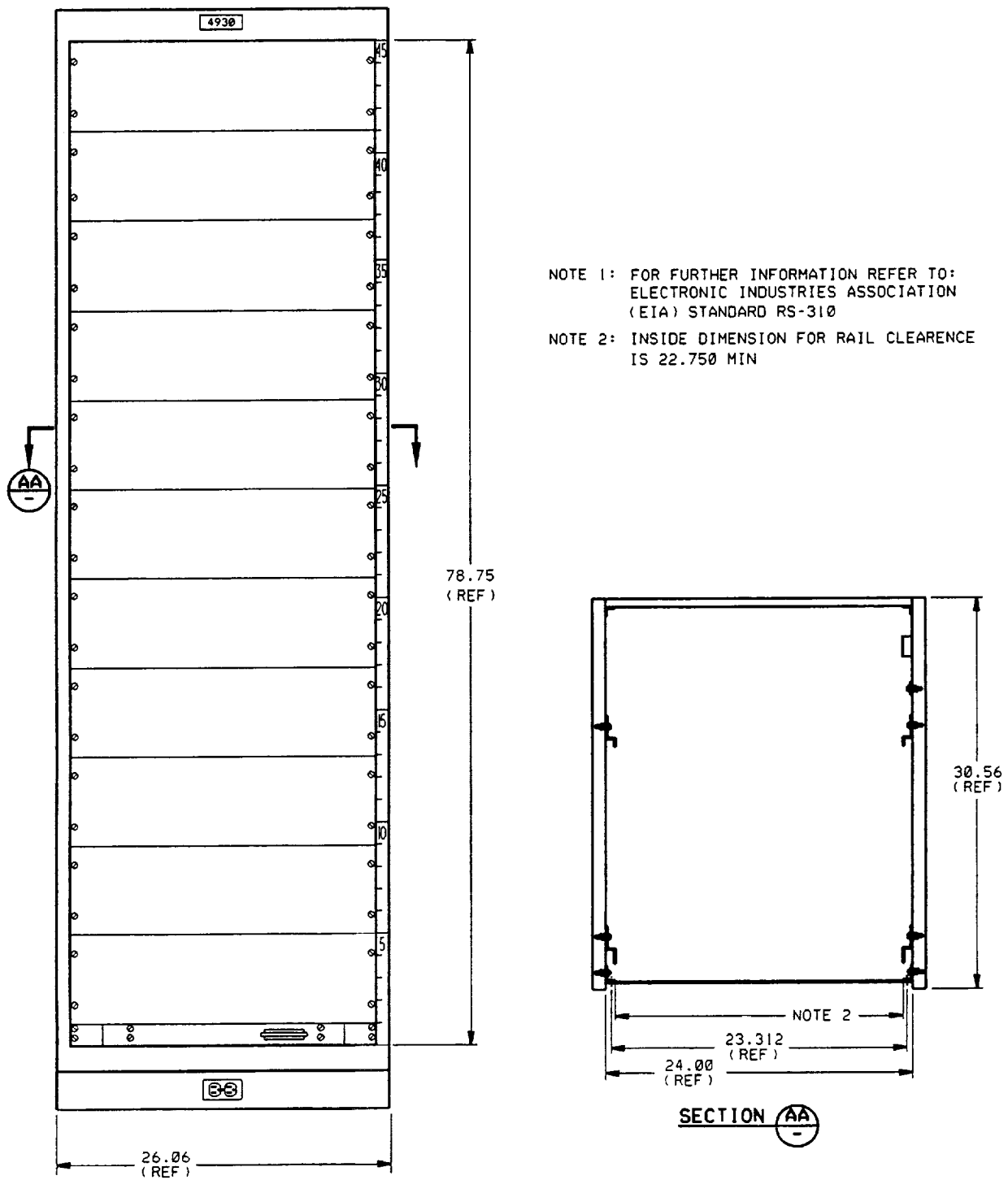
Payloads requiring command and data after closure of the payload bay doors must provide this capability either via the T-0 umbilical using payload provided GSE, or via Orbiter systems within the local capabilities and operational constraints of the Space Shuttle Program (SSP).

All payload commanding through the T-0 umbilical will normally be completed no later than the start of SSP cryogenic propellant loading at 11 hours before launch. If commands are required between L-11 hours and T-9 minutes, they must be specifically approved by the SSP and documented in the Flight Operations Support Annex (FOSA) of the Payload Integration Plan (PIP).

From thirty minutes before launch until launch, the amount of current being transferred through the T-0 umbilical must be limited to 500 milliamps/circuit (per wire pair).

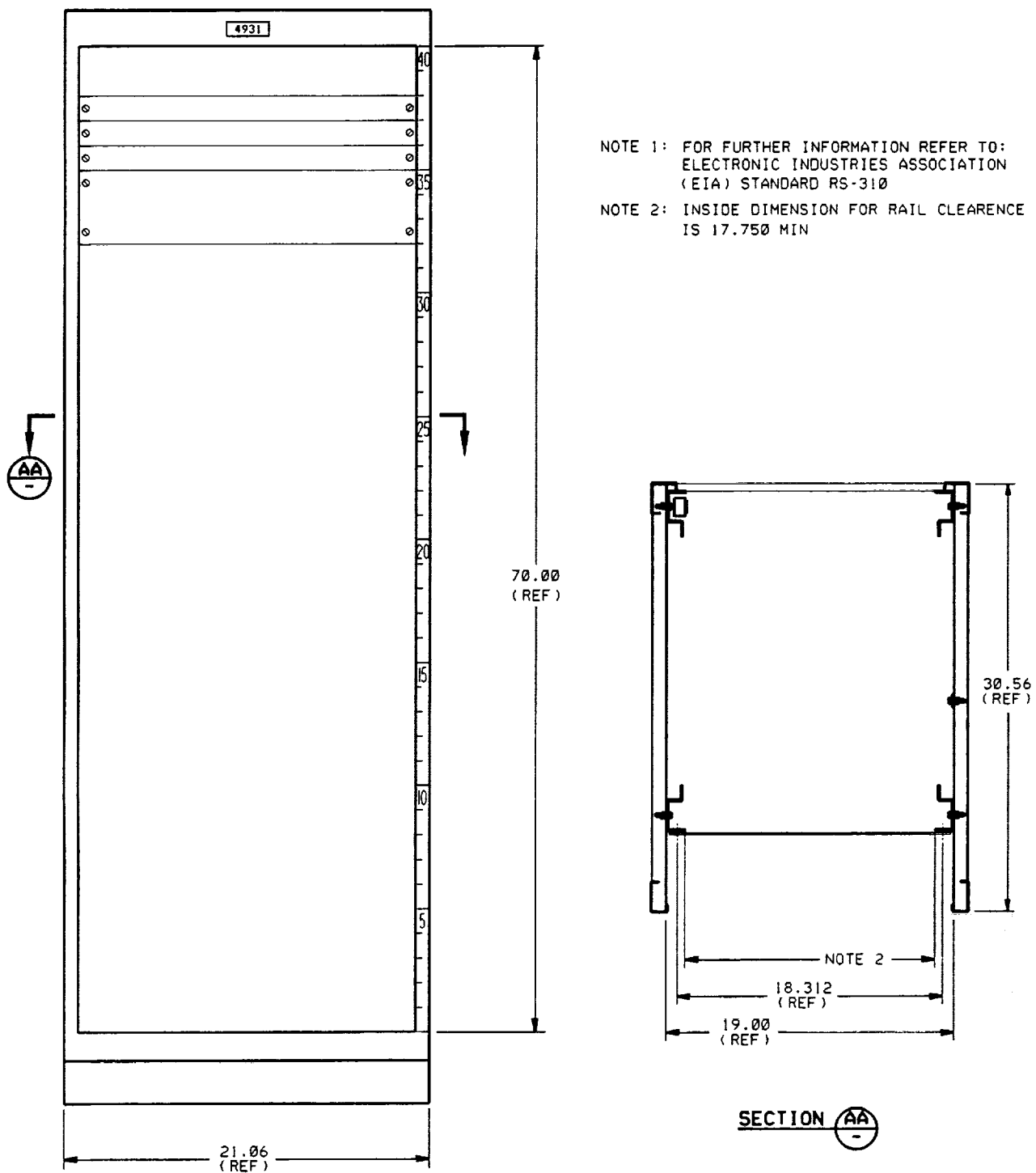
If the commands are mandatory for launch, then redundancy in communication links, ground command systems, and telemetry verification capability will be required. In no case will commanding be permitted after the start of the T-9 minute hold, which is normally ten minutes prior to launch.

Payloads which use a remote Payload Operations Control Center (POCC) for commanding must certify that protection against accidental command sending exists.



RACK 4930
DIMENSIONS FOR 24.00 INCH PANELS

FIGURE 2.4.5-1 USER RACK 4930



RACK 4931

DIMENSIONS FOR 19.00 INCH PANELS

FIGURE 2.4.5-2

USER RACK 4931

A complete set of SSP requirements placed on the customer for remote POCC command procedures is documented in "Command Requirements and Guidelines for NSTS Customers," NSTS 19943.

2.6 USERS' OBLIGATION TO LAUNCH SITE SUPPORT MANAGER (LSSM)

Provide the following:

- a. A list of the required circuit transmissions (remote monitoring, payload commands, telemetry, etc.) describing the type and frequency of each signal on each circuit, and the jack and pins used. Pin functions and circuit assignments for the T-0 cables are established by the Payload Unique ICD.
- b. The power requirements and physical size of all GSE.
- c. When requested by LSSM, a grounding schematic of GSE.
- d. A formal request (necessary for any optional service the GSE/user may require).

NASA can provide a number of optional services that encompass the installation and use of GSE in order to solve unforeseen problems that may arise. Individual requests must be directed to the LSSM, and must be funded by the user.

2.7 SHARING OF RESOURCES

It is important to understand that the system interface is a shared facility. The LSSM must coordinate the requirements of multiple users with the payload integration organization to ensure sufficient jacks and circuits are available when other missions are being processed simultaneously. The circuits from the user interface to the payload may be required for long periods of testing for all elements of the mission, (e.g., upper stages, pallets, etc.).

As a general rule, the user may assume access to a percentage of the system interface resources, equal to the percentage of Orbiter payload capacity that the user has been allocated. As an example, a payload with a Payload Assist Module (PAM) upper stage comprises 25% of the Orbiter payload capacity, and, therefore, 25% of the GSE connectors, 25% of the wideband circuits, and 25% of electrical utility outlets, etc., may be used for the spacecraft and upper stage combined. Requirements in excess of this share must be brought to the attention of the LSSM as soon as they are realized.

3.0 FACILITIES DESCRIPTION

3.1 VPF TEST CELLS (EAST AND WEST) AND ROOM 104

All resources required at KSC must be coordinated with the LSSM.

3.1.1 LOCATION

The two VPF Test Cells are located at the north end, inside the VPF hibay. The cells are identified by their location as the East Test Cell and West Test Cell. Both test cells have eight levels (Floor or 0', 15', 25', 35', 45', 55', 65', and 75' levels). Ref Figures 3.2.1-1 thru 3.2.1-8.

Some of the T-0 System hardware is located in the middle of the two test cells on the floor level. The remainder of the hardware is located in room 104 of the VPF which is located outside the hibay on the east side of the building.

3.1.2 ACCESS

The VPF Hibay is most easily accessed by personnel through the hibay main entrance located on the west side of the VPF. Hand-portable GSE can also be routed to the hibay through the main entrance, but larger equipment should utilize the equipment airlock also located on the west side of the building. Once the GSE is inside the hibay, it can either be manually carried up either of the two stairways located by the east and west walls of the hibay or, if required, lifted via the equipment elevator or one of the VPF cranes to the required level.

Room 104 measures 17'-8" by 25'-6" and equipment access is via a door from outside the building measuring 5'11" wide by 6'-10" high. One entrance and exit point exists, See Figure 3.1.2-1. 3.1.2-2 and 3.1.2-3.

3.1.3 FACILITY POWER

20 Amp and 30 Amp, 120 volt, single-phase electrical power is readily available near the T-0 System hardware. There are three 30 Amp and four 20 Amp services available to the user. The 30 Amp receptacles are NEMA L5-30R, the 20 Amp receptacles are NEMA L5-20R.

Additional services may be available in the VPF, but must be coordinated through the LSSM.

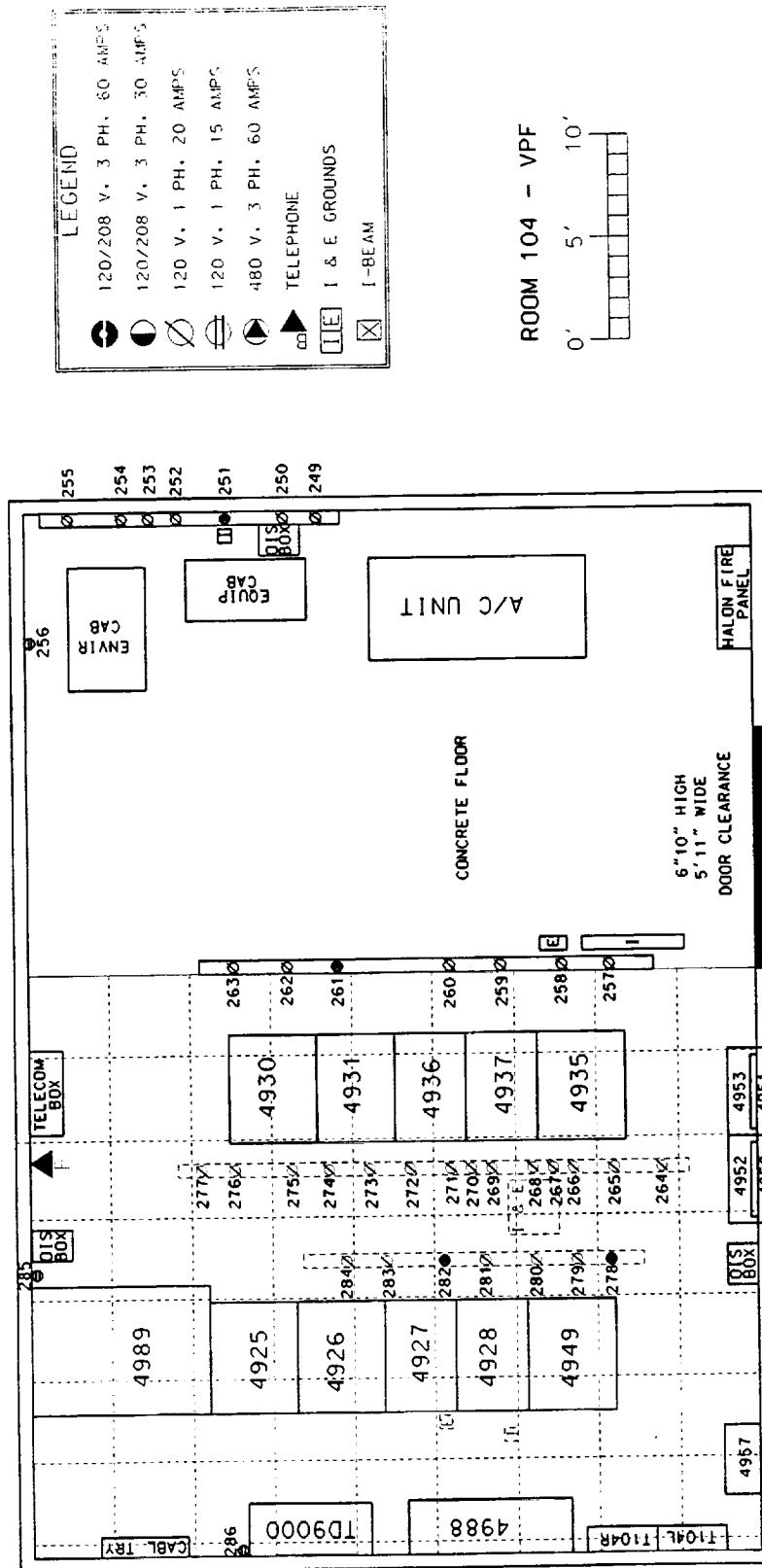
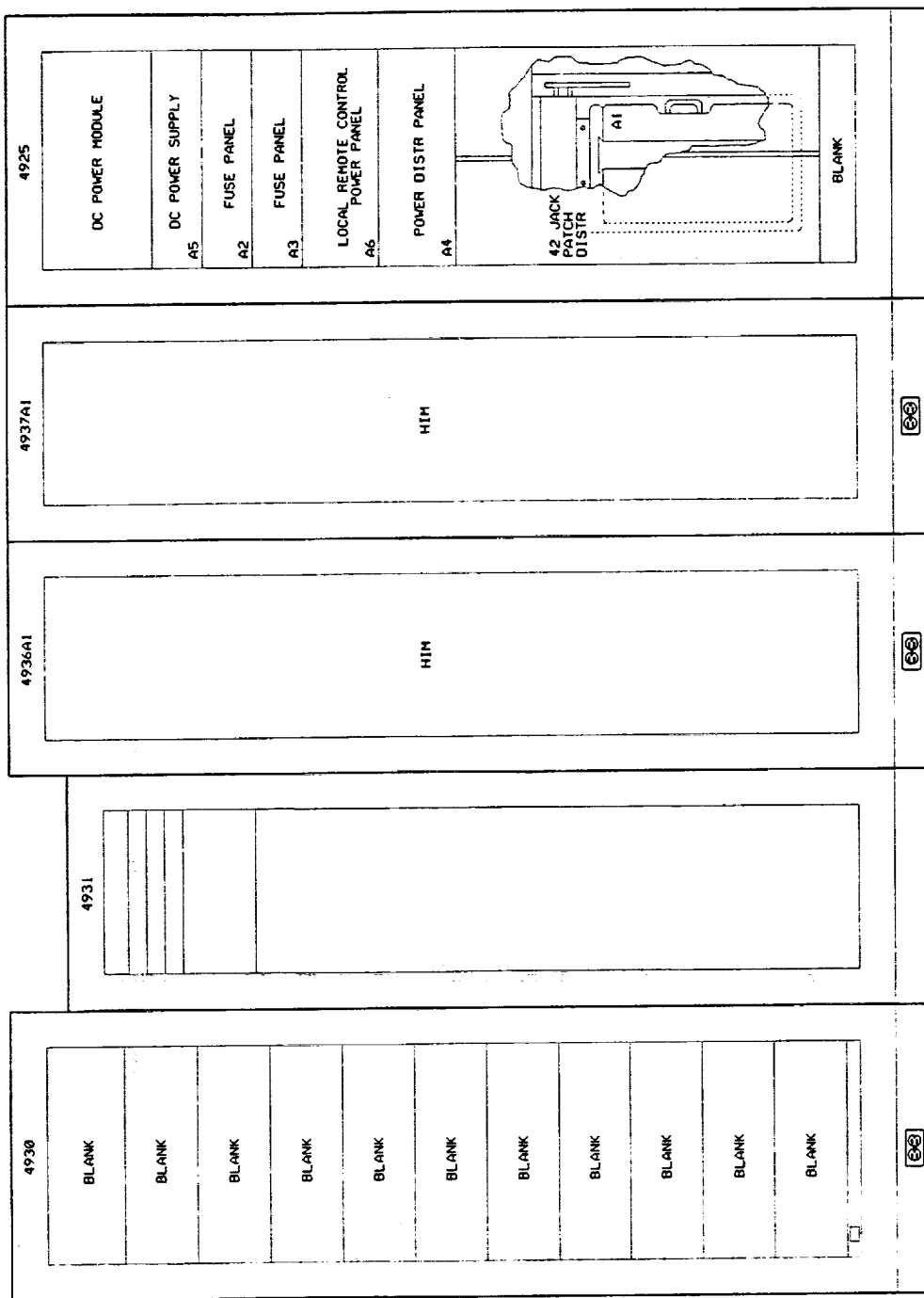


FIGURE 3.1.2-1

ROOM 104



RACK ELEVATION ROOM 104
RACKS 4930, 4931, 4936A1, 4937A1, AND 4925
(FRONT DOORS OF RACKS REMOVED FOR CLARITY)

FIGURE 3.1.2-2 RACK ELEVATIONS ROOM 104

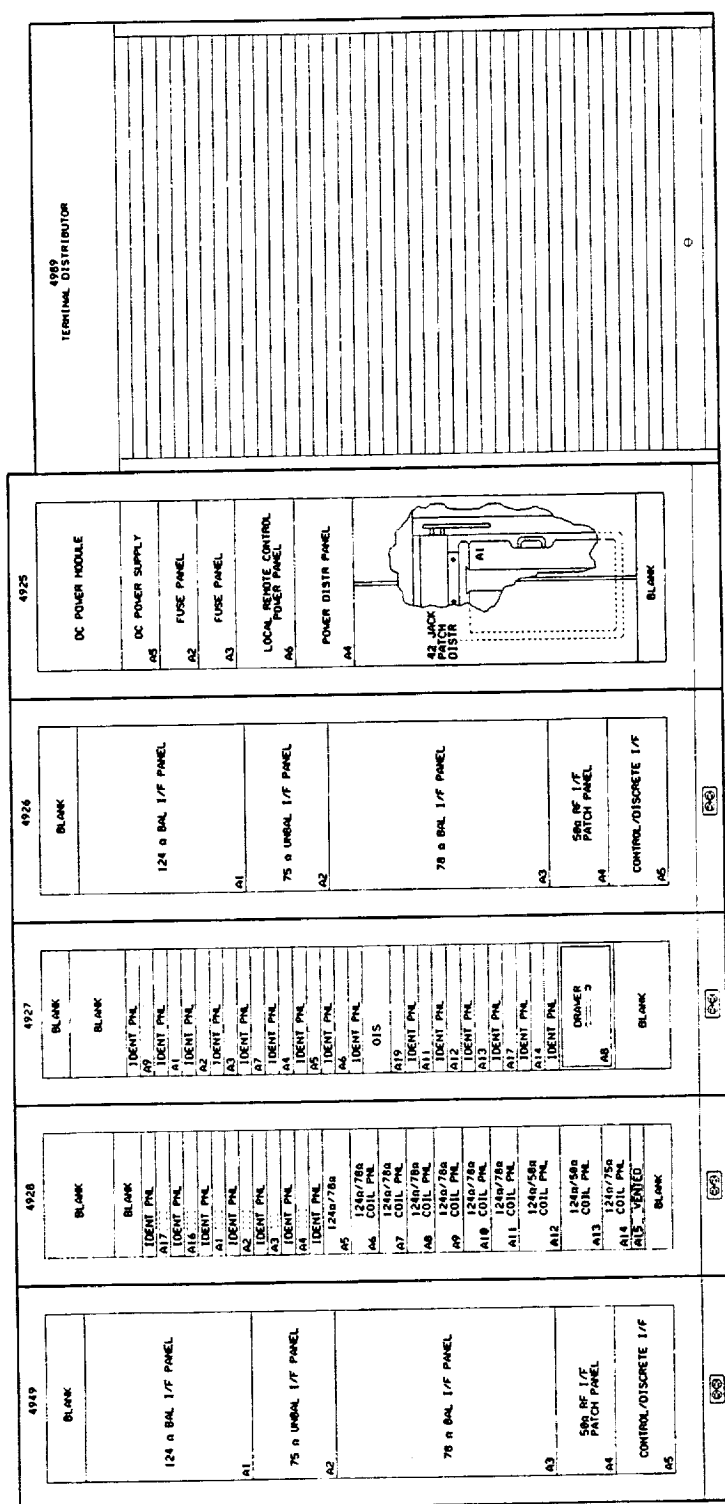


FIGURE 3.1.2-3 RACK ELEVATIONS ROOM 104

RACK ELEVATION ROOM 104

RACKS 4949, 4928, 4927, 4926, 4925 AND ID4989
(FRONT DOORS OF RACKS REMOVED FOR CLARITY)

3.1.4 SYSTEM INTERFACE ACCESS

The following sub-categories are based on the system interfaces available at the Pad. In most cases, the interfaces are only simulated and direct access to the actual interface is not available.

3.1.4.1 UMBILICAL

All umbilical equivalent circuits are available from the East Cell to Rack 4926 and from the West Cell to Rack 4949.

3.1.4.2 EAST CELL

All umbilical equivalent circuits are available as stated in 3.1.4.1 . 124-ohm circuits are provided for access to the wideband system.

3.1.4.3 WEST CELL

All umbilical equivalent circuits are available as stated in 3.1.4.1. 124-ohm circuits are provided for access to the wideband system.

3.1.4.4 EXTERIOR TRAILER INTERFACES

Available to Panels 4950, 4951, 4956 and 4957 are Umbilical Equivalent Circuits, (except J72 and J73) ten 124-ohm circuits, twenty twisted shielded pairs in one forty conductor cable and 30 circuits in one sixty conductor 16 gauge cable. Refer to Section 3.4 for more information.

3.1.4.5 LAUNCH PROCESS SYSTEM (LPS)

The LPS is directly simulated in the VPF. Connection to the LPS is provided at Test Stand Four, while the Firing Rooms are simulated via rooms 3233 (CITE Control Room A) and 3237 (CITE Control Room B) of the VPF. The same software produced for use in the Firing Rooms will be validated and used in the CITE Control Rooms.

3.1.4.6 COMMUNICATION SERVICE

S-band communication is available on panels 4926A4 and 4949A4 on jacks 17,19,21,23 and 28.

3.1.4.7 OPERATIONAL INTERCOMMUNICATIONS SYSTEM (OIS)

The OIS is provided at the VPF similar to that provided at the Pad, to provide voice communication between different locations in the VPF as well as to remote facilities. Connection to remote facilities must be coordinated through the LSSM.

3.1.4.8 28 VOLT DC POWER

28 Volt DC power is available only for control purposes. If additional uses are required, then a source should be supplied by the user.

3.1.4.9 SIGNAL CONDITIONING

Equivalent signal conditioning of what is available at the Pad is also available in the VPF. (Reference Table 3.1.5.9-1).

3.1.4.10 PAD SURFACE

The Pad Surface is not directly simulated at the VPF. Users requiring additional floor space in the VPF will have to coordinate it through the LSSM.

3.1.4.11 PAYLOAD TERMINAL CONNECTION ROOM (PTCR)

The PTCR is simulated via a variety of methods at the VPF depending on the desired use. The VPF T-0 System hardware provides simulation of the connection points of the PTCR, while some of the Landline simulation is provided both at Test Stand Four and in room 1263 of the VPF.

DEVICE PAD	MATCHING COIL	MATCHING COIL	MATCHING COIL	MIN-LOSS	MIN-LOSS
Type	Balanced to Balanced	Balanced to Unbalanced	Balanced to Unbalanced	Unbalanced to Unbalanced	Unbalanced to Unbalanced
Bandwidth	30 Hz to 4.5 MHz	30 Hz to 4.5 MHz	20 Hz to 6 MHz	DC to 1 GHz	1 GHz to 1.5 GHz
Frequency Response dB	+/- 2	+/- 2	+/- .5	+/- .5	+/- 1
Min Input Voltage p-p	.8	.8	.8	1.0	1.0
Max Input Voltage p-p	6.0	6.0	6.0	5.0	5.0
Insertion Loss	-2.9 dB at 1V p-p input	-2.1 dB at 1V p-p input	-1 dB at midboard	5.7 dB max	5.7 dB max
Impedance	124 ohms 78 ohms	124 ohms 75 ohms	124 ohms 50 ohms	50 ohms 75 ohms	50 ohms 75 ohms

Table 3.1.5.9-1 System Interface Specification Table

3.1.5 CONNECTORS

Table 3.1.5-1 lists connectors used in VPF T-0 System. The table also provides recommended connectors for the Users GSE for connection to the T-0 System. These connectors are identical to those needed for the Pad T-0 System.

TO/FROM IMPEDANCE MATCHING EQUIPMENT / PATCHING SERVICE

SERVICE CONNECTOR	INTERFACE LOCATION	FACILITY (1) CABLE TYPE	FACILITY CONNECTOR	RECOMMENDED MATING
124 ohm twinax	4926A1-4949A1 J1-J40	TWC-124-2	82-5635 (Amphenol)	22275 (Amphenol)
75 ohm unbalanced	4926A2-4949A2 J1-J56	RG59B/U	UBJ26-2 (Trompeter)	UPL20-2 (Trompeter)

TO/FROM EAST CELL 275 ft +/-50

SERVICE CONNECTOR	INTERFACE LOCATION	FACILITY (1) CABLE TYPE	FACILITY CONNECTOR	RECOMMENDED MATING
J55 umbilical	4926A5 J2	60(60#16)OS	MS3119E24-61C	MS3476L24-61S
J58 umbilical	4926A5 J1	60(60#16)OS	MS3119E24-61C	MS3476L24-61S
J59 umbilical	4926A3 J57-J81	BL784	82-5635	22275 (Amphenol)
J63 umbilical	4926A3 J13-J15	4(4#4) OS	10-194432-17S (Bendix)	MS17344R32L17P
J67 umbilical	4926A3 J109-J126	FSI4-50	82-5635	22275 (Amphenol)
J69 umbilical	4926A3 J127-J144	FSI4-50	82-5635	22275 (Amphenol)
J72 umbilical	4926A4 J13-J16	RG58B/U	874PFL	0874-9415
J73 umbilical	4926A4 J9-J12	RG58B/U	874PFL	0874-9415
J74 umbilical	4926A5 J10-J12	4(4#4) OS	10-194432-17S (Bendix)	MS17344R32L17P

TO/FROM WEST CELL

SERVICE CONNECTOR	INTERFACE LOCATION	FACILITY (1) CABLE TYPE	FACILITY CONNECTOR	RECOMMENDED MATING
J55 umbilical	4949A5 J2	60(60#16)OS	MS3119E24-61C	MS3476L24-61S
J58 umbilical	4949A5 J1	60(60#16)OS	MS3119E24-61C	MS3476L24-61S
J59 umbilical	4949A3 J57-J81	BL784	82-5635	22275 (Amphenol)
J63 umbilical	4949A3 J13-J15	4(4#4) OS	10-194432-17S (Bendix)	MS17344R32L17P
J67 umbilical	4949A3 J109-J126	FSI4-50	82-5635	22275 (Amphenol)
J69 umbilical	4949A3 J127-J144	FSI4-50	82-5635	22275 (Amphenol)
J72 umbilical	4949A4 J13-J16	RG58B/U	874PFL	0874-9415
J73 umbilical	4949A4 J9-J12	RG58B/U	874PFL	0874-9415
J74 umbilical	4949A5 J10-J12	4(4#4) OS	10-194432-17S (Bendix)	MS17344R32L17P

Table 3.1.5-1 Table of connectors - Room 104

EXTERIOR TRAILER INTERFACES

SERVICE CONNECTOR	INTERFACE LOCATION	FACILITY (1) CABLE TYPE	FACILITY CONNECTOR	RECOMMENDED MATING
124 Ohm	TD4957J1-J8, J11-12	T/43	79K28234 (UG493A/U	22275 (Amphenol)
Instrumentation	TD4957J9	40(20PTISI#16)0S	HK00140-81S	HK06L40-81P
Instrumentation	TD4957J10	60(60#16)OS	HK00140-81S	HKO6L40-81P
S-Band	4926A4 J9, J11, J13, J15, J16	FSJ4-5OB	874-PFL	0874-9415

Table 3.1.5-1 Table of connectors - Room 104(cont'd)

3.2 EAST CELL

3.2.1 LOCATION

The North end of the High Bay contains the East and West Cells. The two cells are identical in design, layout, and facilities and are located on the east and west sides of the High Bay respectively (See figures 3.2.1-1 through 3.2.1-8).

3.2.2 ACCESS

The East Cell is broken into seven levels starting at the 15'-0" level, and in ten foot increments, continuing to the 75'-0" level. Any of the levels may be accessed by elevator or stairwell.

3.2.3 FACILITY POWER

There are receptacles providing the following power: 120V-single phase-20A-60Hz, 120/208V-three phase-30A-60Hz, 120/208V-three phase-60A-60Hz, 480V-three phase-200A-60Hz, 480V-three phase-60A-60Hz, 120V-single phase-30A-60Hz located throughout the East Cell. For exact locations see figures 3.2.1-1 through 3.2.1-8.

3.2.4 SYSTEM INTERFACE SERVICE

3.2.4.1 UMBILICAL

All umbilical circuits are simulated and begin in the East Cell and connect to Room 104.

3.2.4.2 WEST CELL

No direct interface to the West Cell exists.

3.2.4.3 LAUNCH PROCESS SYSTEM (LPS)

No LPS connection exists in the East Cell.

3.2.4.4 COMMUNICATION SERVICE

Access to wideband is available at the ground level in 4959. S-band is available at the 35'-0" level at BHP 4954. (See figure 3.2.4.4-1).

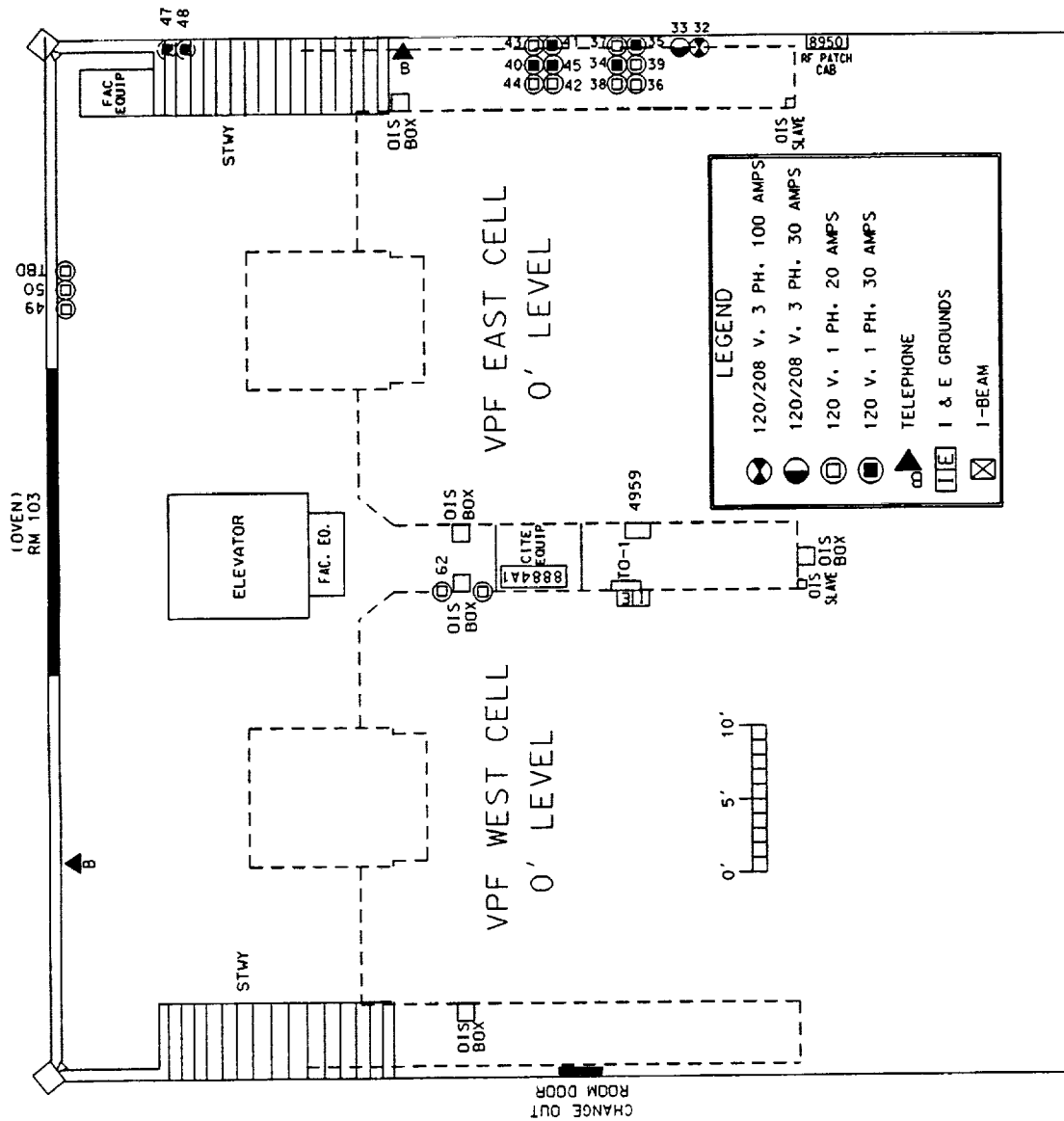


FIGURE 3.2.1-1 VPF 0 FT LEVEL (GROUND FLOOR)

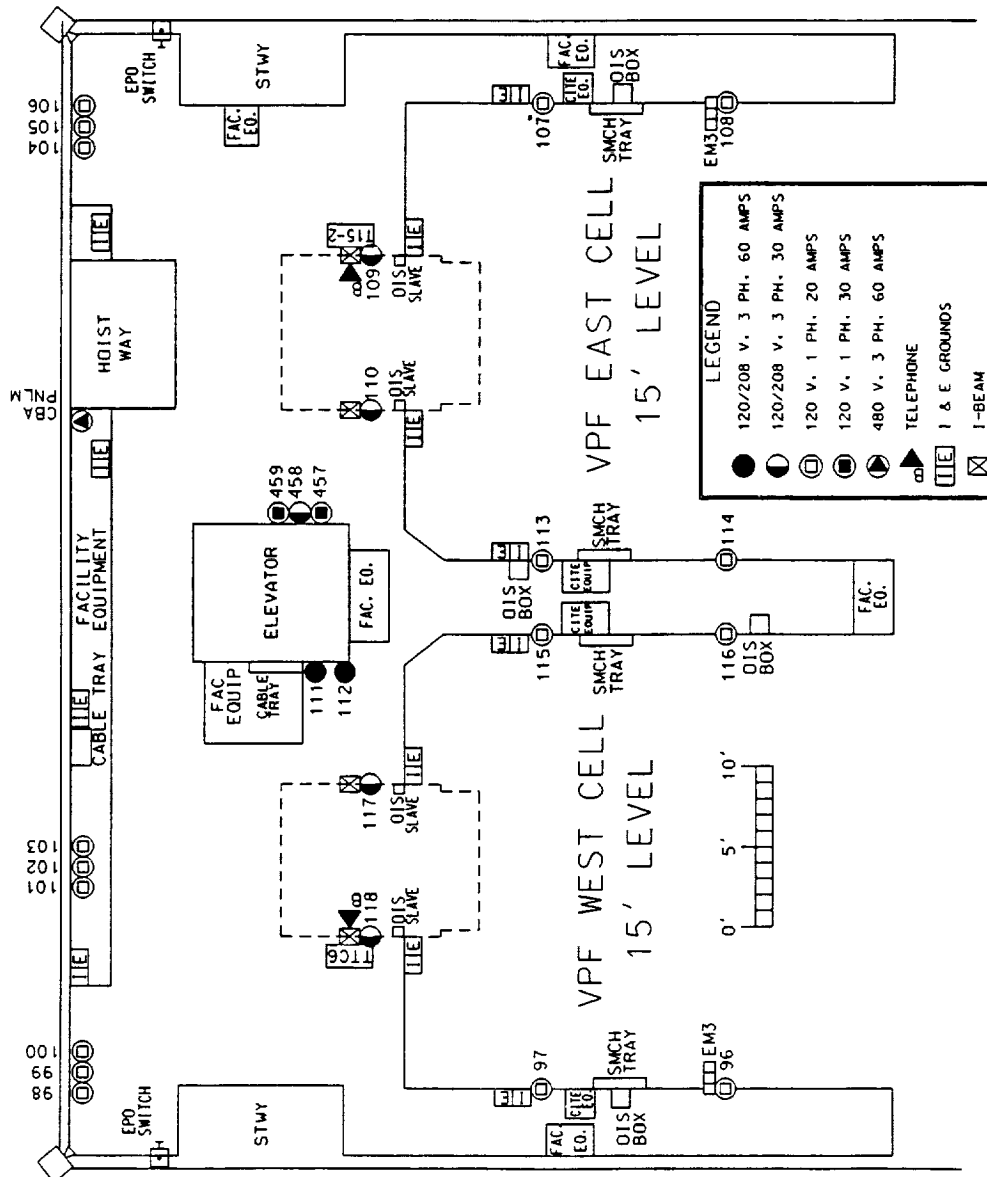


FIGURE 3.2.1-2 VPF 15 FT LEVEL

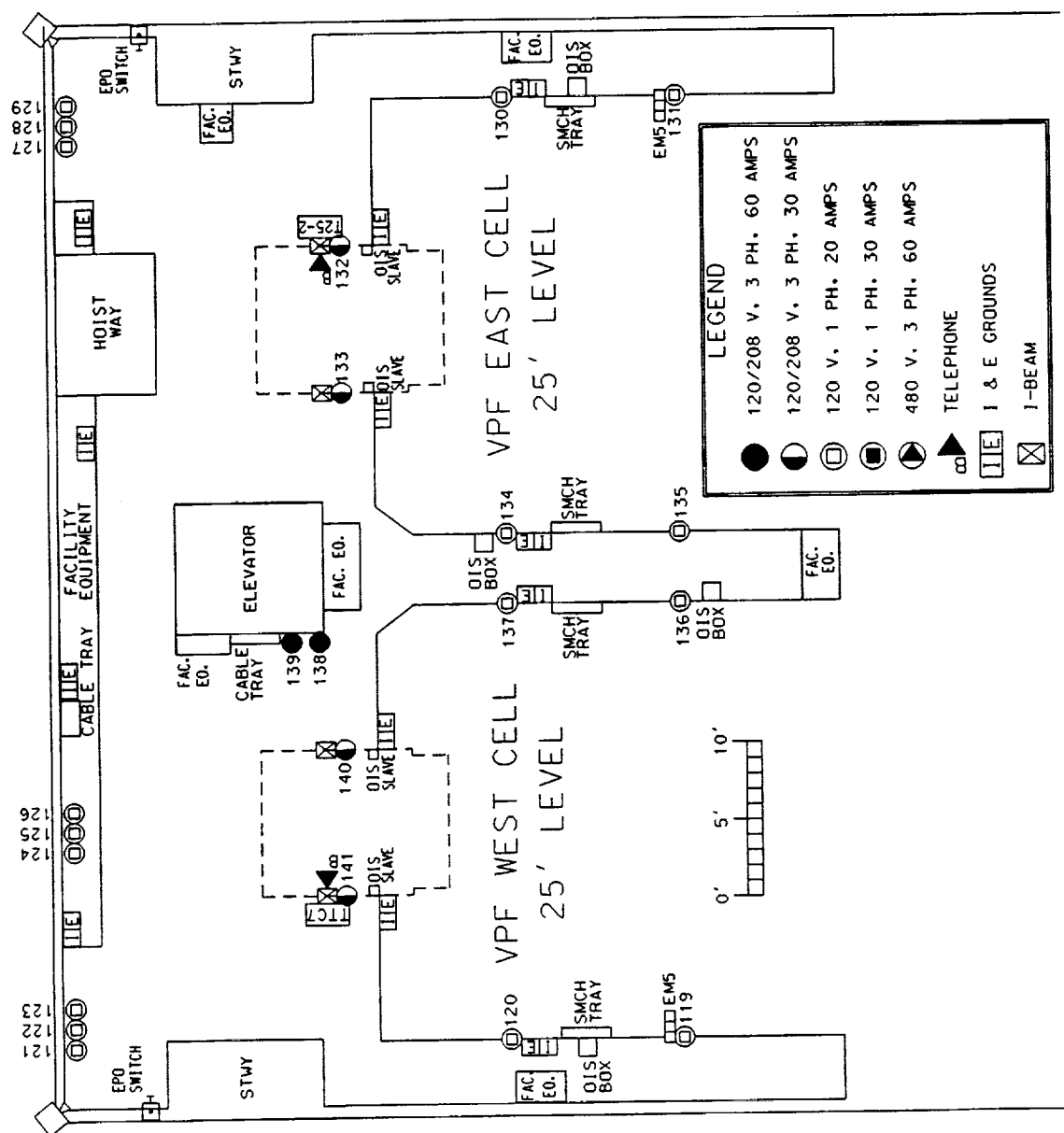


FIGURE 3.2.1-3 VPF 25 FT LEVEL

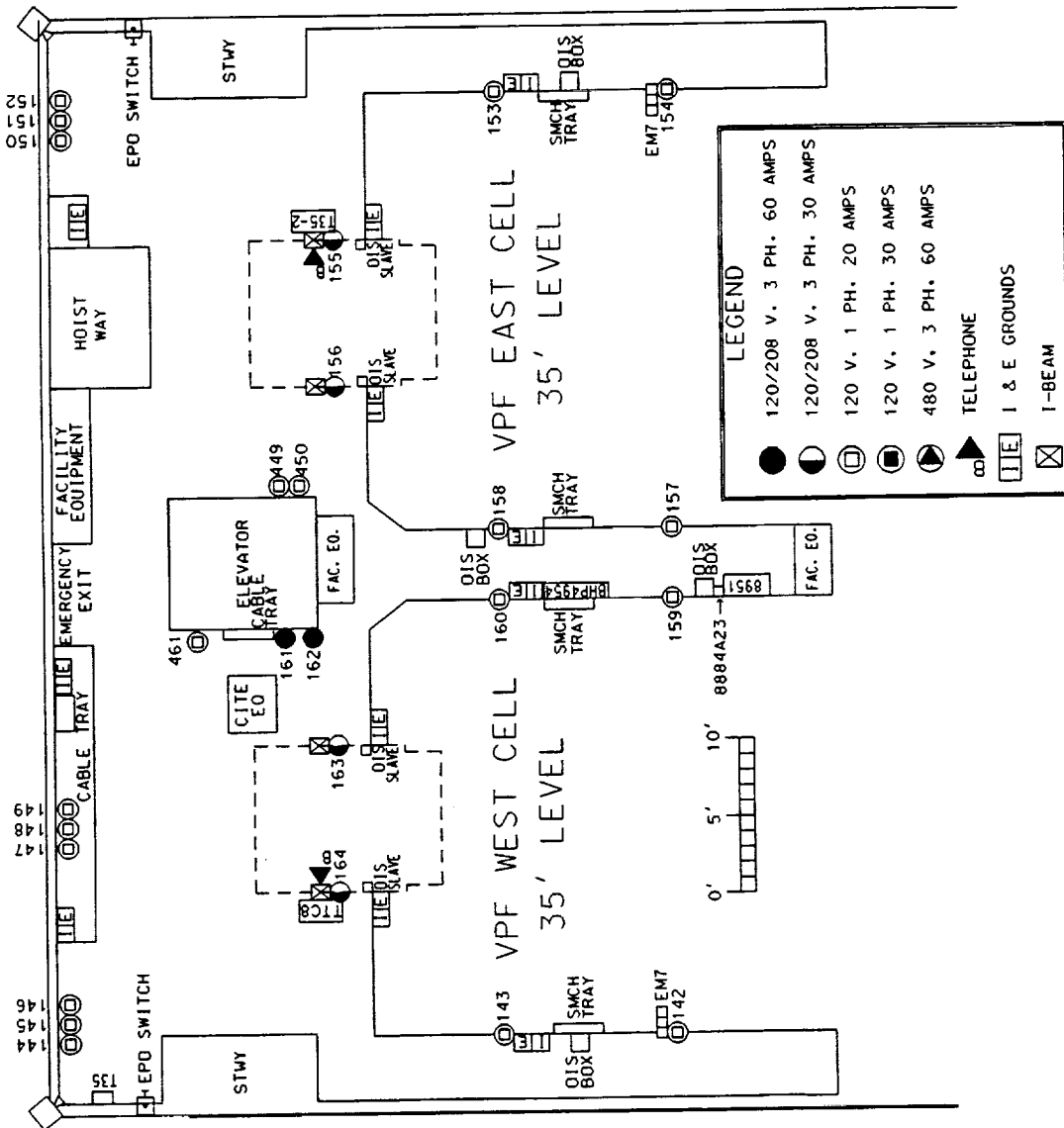


FIGURE 3.2.1-4 VPF 35 FT LEVEL

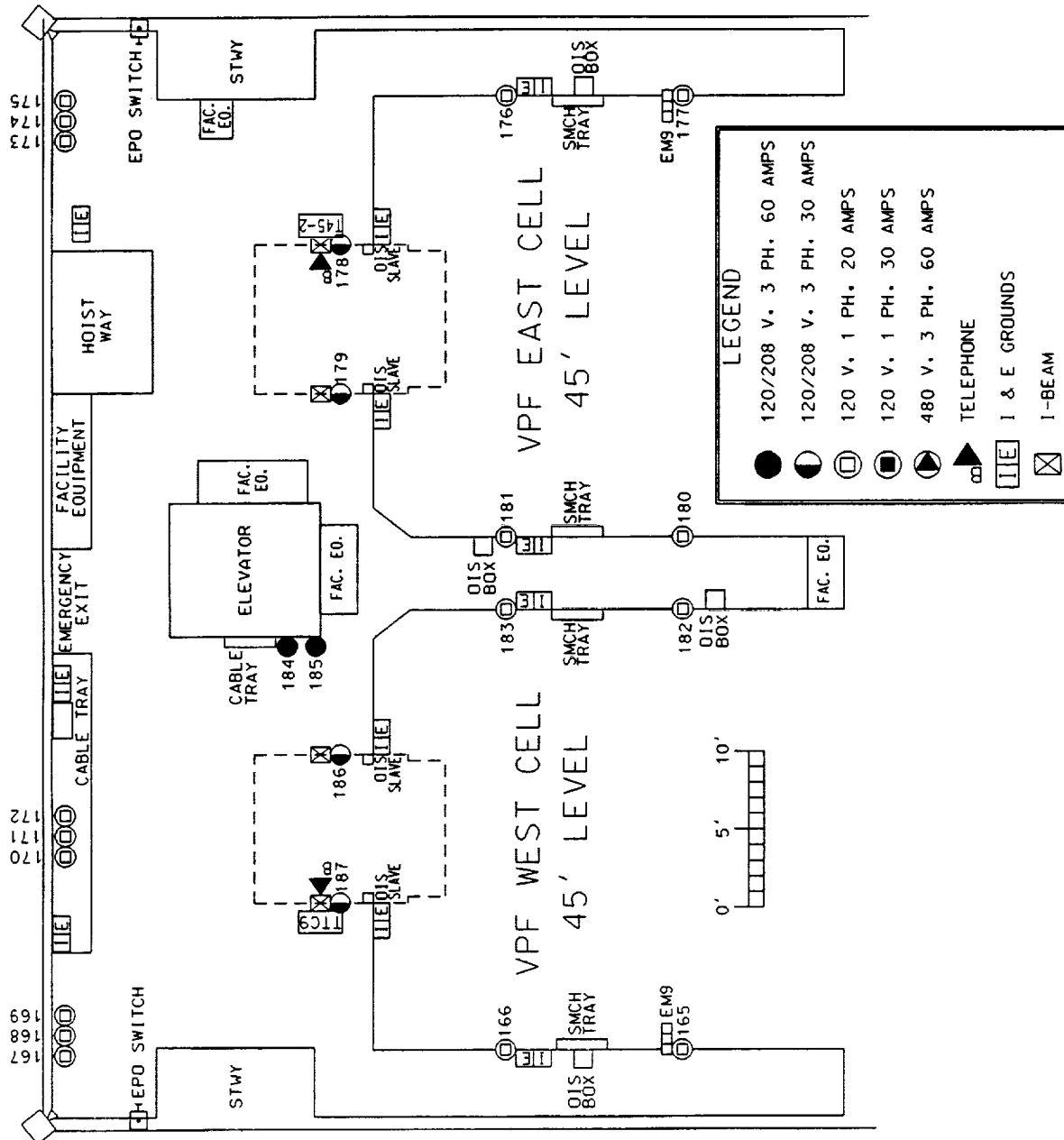


FIGURE 3.2.1-5 VPf 45 FT LEVEL

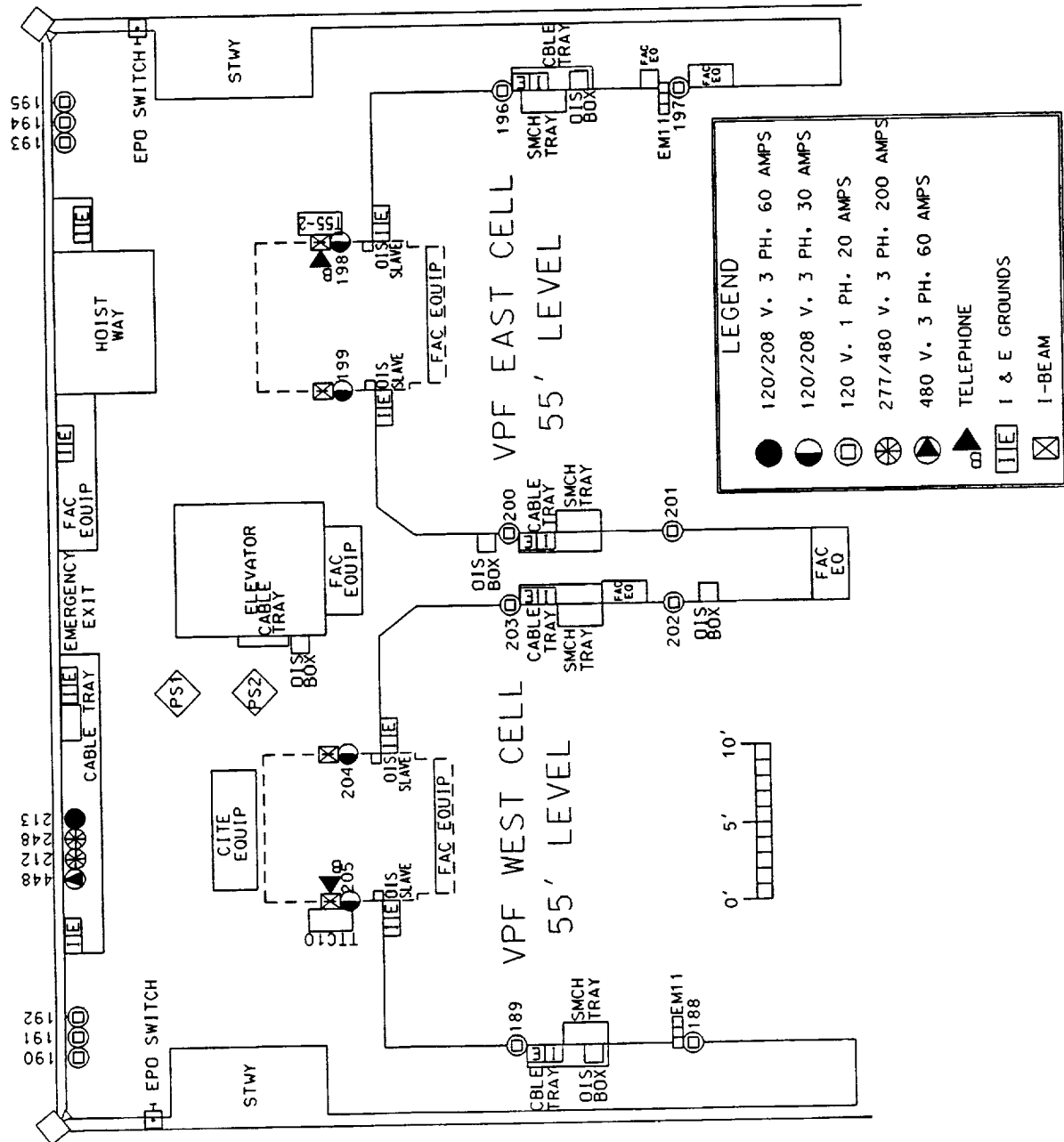


FIGURE 3.2.1-6 VPF 55 FT LEVEL

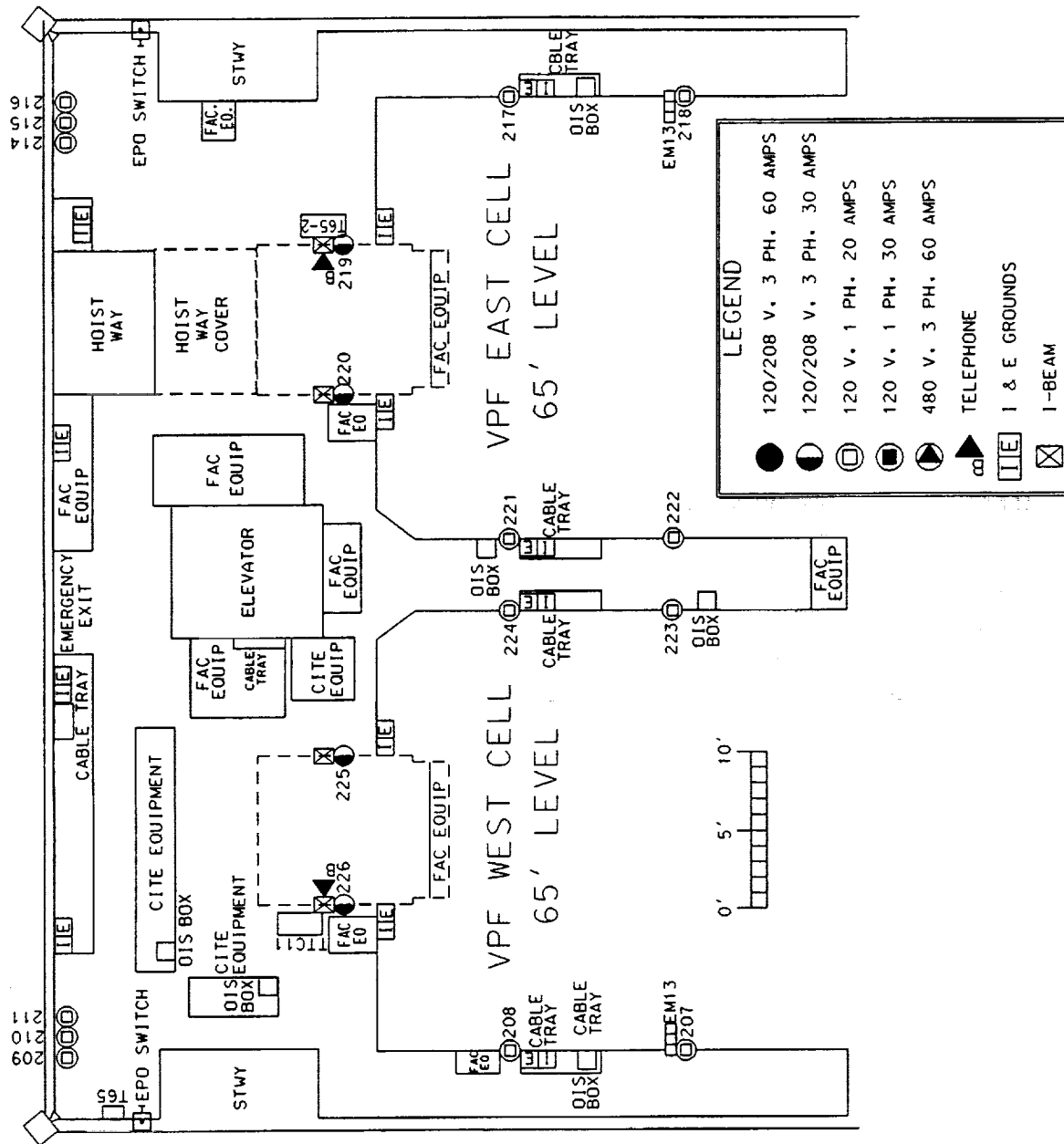


FIGURE 3.2.1-7 VPF 65 FT LEVEL

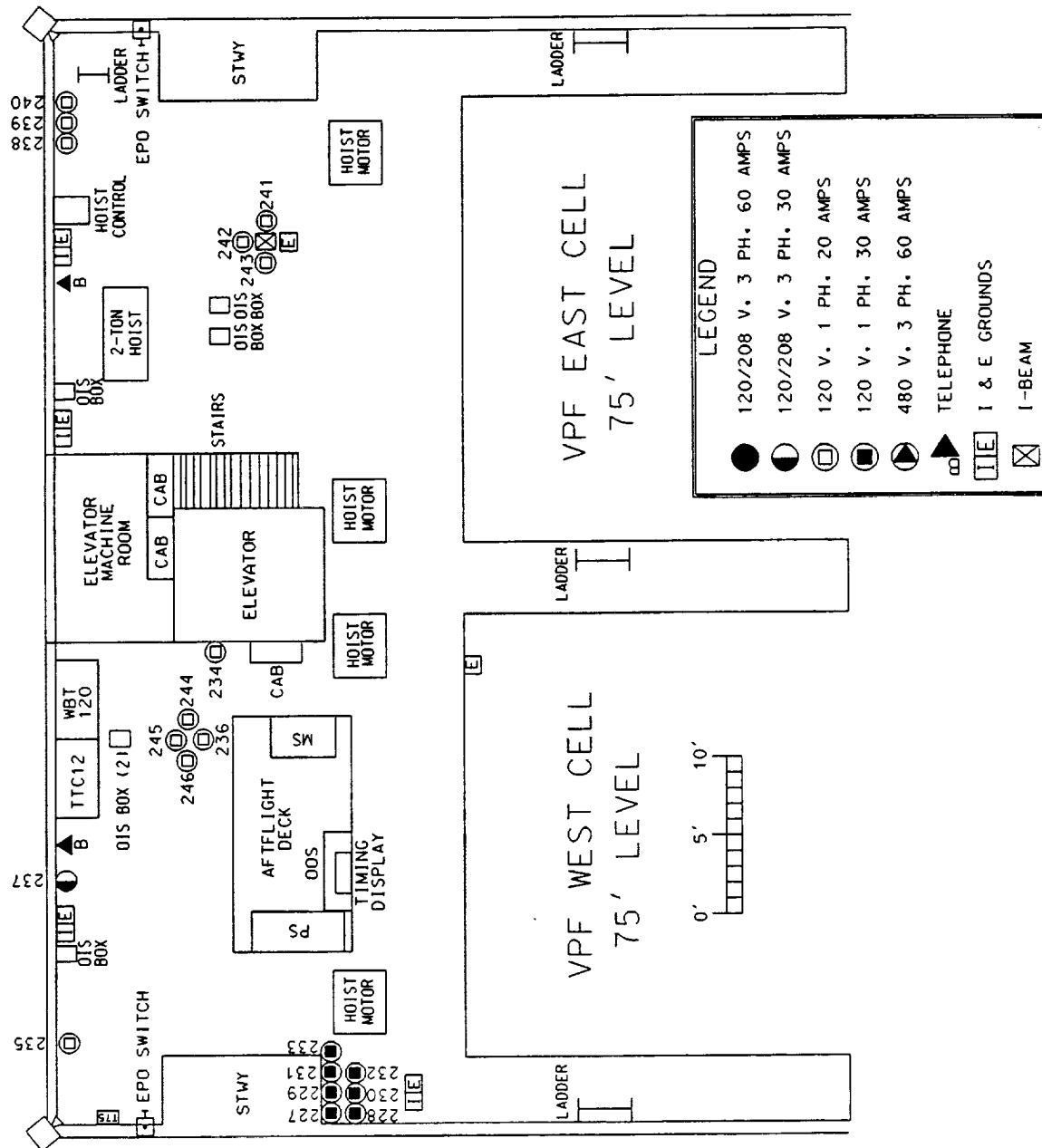
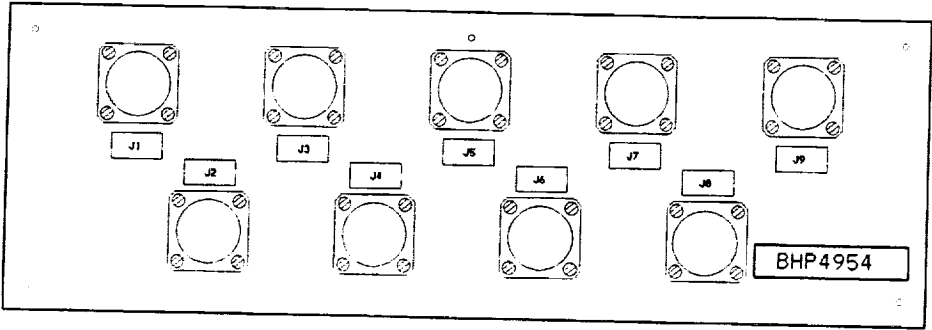


FIGURE 3.2.1-8 VPF 75 FT LEVEL



BHP4954

FIGURE 3.2.4.4-1 BHP 4954

3.2.4.5 OPERATIONAL INTERCOMMUNICATIONS SYSTEM (OIS)

The operational intercom service is available on all levels of the East Cell. See figures 3.2.1-1 through 3.2.1-8 for details.

3.2.4.6 28 VOLT DC POWER

No DC power is available in the East Cell.

3.2.4.7 SIGNAL CONDITIONING

No signal conditioning is provided, so the user must provide as necessary.

3.2.5 CONNECTORS

Table 3.2.5-1 lists connectors used in the East Cell and recommended compatible GSE connectors.

TO/FROM EXTERIOR TRAILER INTERFACE

SERVICE CONNECTOR	INTERFACE LOCATION	FACILITY (1) CABLE TYPE	FACILITY CONNECTOR	RECOMMENDED MATING
Instrumentation	4954 J1-J6	MSFC-SPEC 332/109 40(20PTSI16)OS	HKOOL40-81S	HKO6L40-81P
Instrumentation	4954 J7-J8	MSFC-SPEC 332/130 60(60#16)OS	HKOOL40-81S	HKO6L40-81P
Instrumentation	4954 J9	MSFC-SPEC 332/25 4(4#0) OS	HKOOL40-75S	HKO6L40-75P

TO/FROM ROOM 104 275 ft +/-50

SERVICE CONNECTOR	INTERFACE LOCATION	FACILITY (1) CABLE TYPE	FACILITY CONNECTOR	RECOMMENDED MATING
Wideband	4959J1-J19	T-43	KS16287-L2	22275 (Amphenol)

Table 3.2.5-1 Table of connectors - East Cell

3.3 WEST CELL

3.3.1 LOCATION

The north end of the high bay contains the East and West Cells. The two cells are identical in design and layout, and are located on the east and west side of the high bay respectively (see figures 3.2.1-1 through 3.2.1-8).

3.3.2 ACCESS

The West Cell is divided into seven levels starting at the 15'-0" level and, in ten foot increments, continues to the 75'-0" level. Any of the levels may be accessed by elevator or stairwell.

3.3.3 FACILITY POWER

There are receptacles providing the following power: 120V-single phase-20A-60Hz, 120/208V-three phase-30A-60Hz, 120/208V-three phase-60A-60Hz, 480V-three phase-200A-60Hz, 480V-three phase-60A-60Hz, 120V-single phase-30A-60Hz. These receptacles are located throughout the cell (See Figures 3.2.1-1 through 3.2.1-8).

3.3.4 SYSTEM INTERFACE

3.3.4.1. UMBILICAL

All umbilical circuits begin from the West Cells payload, and run to Room 104.

3.3.4.2 EAST CELL

No direct interface to the East Cell exists.

3.3.4.3 LPS

No LPS connection exists.

3.3.4.4 COMMUNICATION SERVICE

In the West Cell there are no communication circuits.

3.3.4.5 OIS

The operational intercom service is available on all levels of the West Cell (See figures 3.2.1-1 through- 3.2.1-8).

3.3.4.6 28 VOLT DC POWER

No DC power is available in the West Cell.

3.3.4.7 SIGNAL CONDITIONING

No signal conditioning is provided, so the user must provide as necessary.

3.3.5 CONNECTORS

Table 3.3.5-1 lists connectors used in the West Cell recommended compatible GSE connectors.

TO/FROM EXTERIOR TRAILER INTERFACE

SERVICE CONNECTOR	INTERFACE LOCATION	FACILITY (1) CABLE TYPE	FACILITY CONNECTOR	RECOMMENDED MATING
Instrumentation	4954 J1-J6	MSFC-SPEC 332/109 40(20PTSI16)OS	HKOOL40-81S	HKO6L40-81P
Instrumentation	4954 J7-J8	MSFC-SPEC 332/130 60(60#16)OS	HKOOL40-81S	HKO6L40-81P
Instrumentation	4954 J9	MSFC-SPEC 332/25 4(4#0) OS	HKOOL40-75S	HKO6L40-75P

TO/FROM ROOM 104 275 ft +/-50

SERVICE CONNECTOR	INTERFACE LOCATION	FACILITY (1) CABLE TYPE	FACILITY CONNECTOR	RECOMMENDED MATING
WIDEBAND	4959 J1-J19	T43	KS16287-L2	22275 (Amphenol)

Table 3.3.5-1 Table of Connectors - West Cell

3.4 EXTERIOR TRAILER INTERFACES

3.4.1 LOCATION

The exterior trailers interfaces include panels 4950, 4951, 4955, and 4956. Panels 4950 and 4951 are located on the outer wall of Room 104 on the east facing side. These panels are to the left of the entrance doors to Room 104. (See figure 3.4.1-1)

Panels 4955 and 4956 are located away from the VPF to the northern most accessible point on the VPF's paved surface. (See figures 3.4.1-2 - 3.4.1-3).

3.4.2 ACCESS

There are padlocks protecting both sets of the panels mentioned above. Only employees at the VPF can open the locks to access the panels. The facilities manager will be able to assist in accessing these panels.

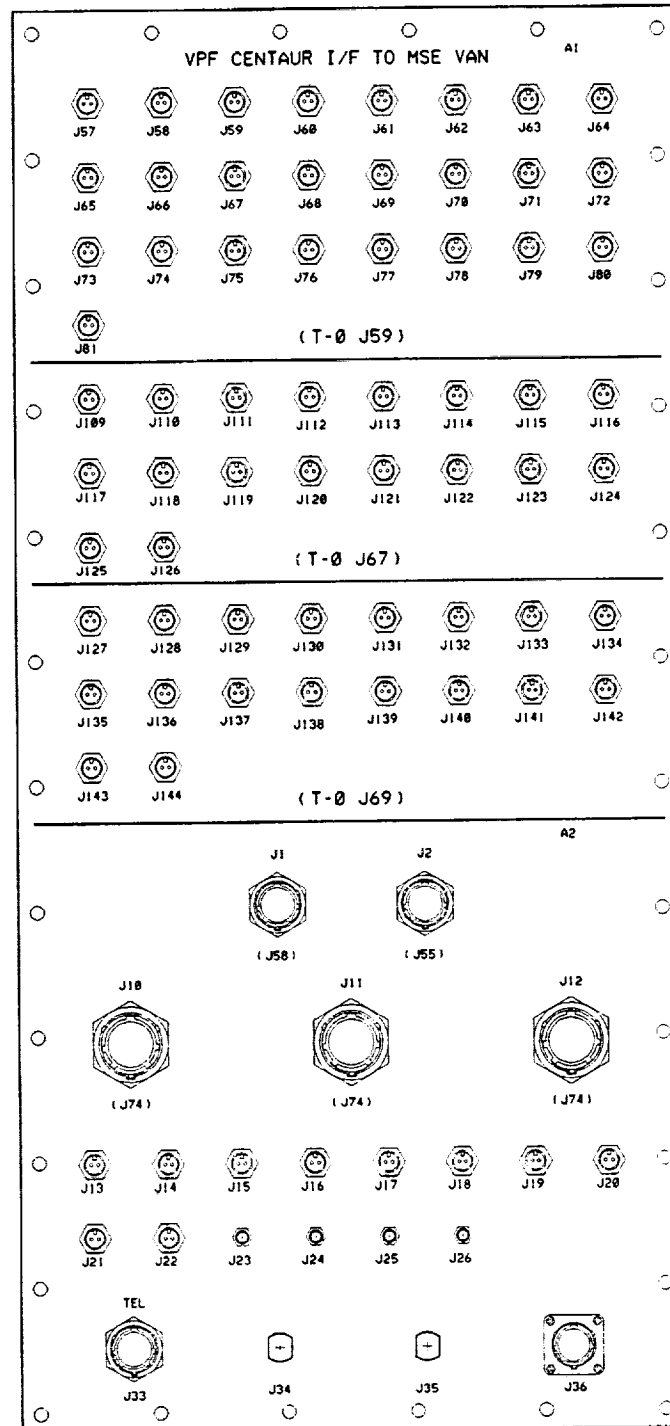


FIGURE 3.4.1-1 MSE INTERFACE 4950 AND 4951

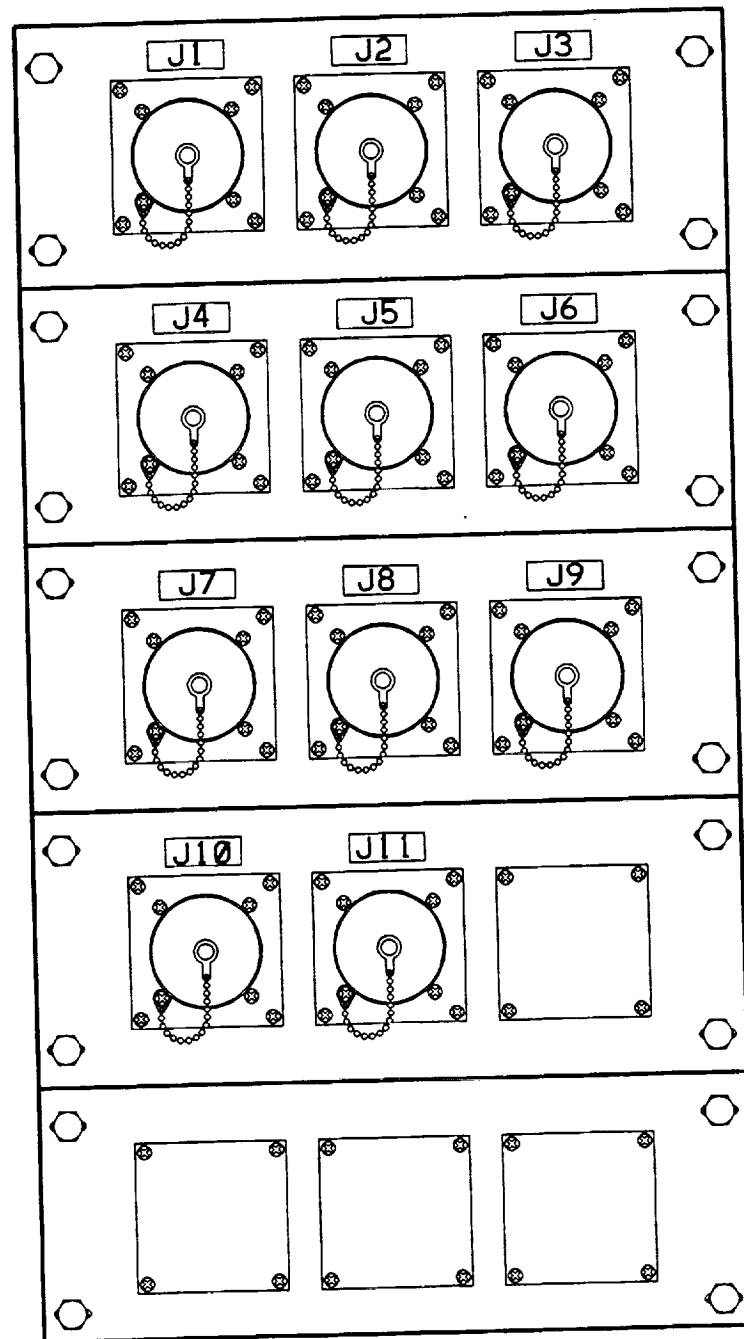


FIGURE 3.4.1-2 TERMINAL DISTRIBUTOR TD 4955

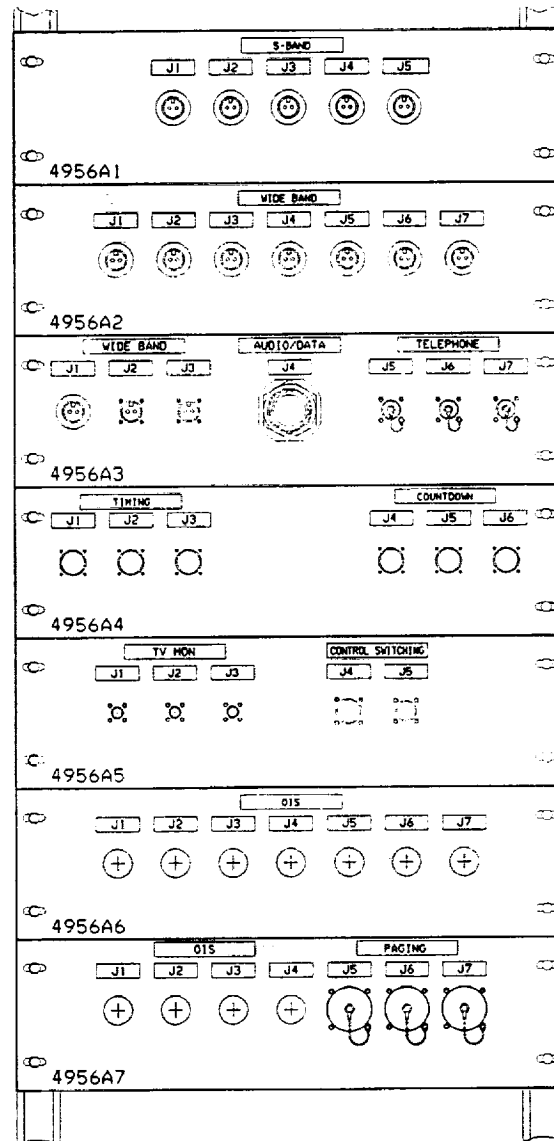


FIGURE 3.4.1-3 TERMINAL DISTRIBUTOR TD 4956

3.4.3 FACILITY POWER

Power receptacles are located on the north side (outside) of the wall at Room 104. There are two (2) 120/208V, 30, 100A, 60Hz, and six (6) 120/208V, 30, 60A, 60Hz. These are located near 4950 and 4951, which is on the adjacent wall past the entrance to Room 104.

There are power receptacles located near TD4955 and TD4956 on the far north side of parking apron. Power available is three (3) 120/208V, 30, 100A, 60Hz and two (2) 480V, 30, 100A and 60Hz.

3.4.4 SYSTEM INTERFACE SERVICE

3.4.4.1 UMBILICAL

Umbilical circuits J59, J67, J69, J58, J55, and J74 are available through panels 4950 and 4951.

3.4.4.2 ROOM 104

Ten (10) 124 ohm circuits and five (5) S-band circuits are available from 4955. 20 twisted shielded pairs in one 40 conductor cable and 30 circuits on one, 60 conductor 16 gauge cable are available from 4956.

3.4.4.3 LPS

No direct interface to LPS exists in Room 104.

3.4.4.4 COMMUNICATION SERVICE

Panel 4956 has audio/data, telephone, timing and countdown, CCTV . On Panel 4955, narrow band is available.

3.4.4.5 OIS

Connections exist for OIS.

3.4.4.6 28 VOLT DC POWER

No DC power is available near the exterior trailers.

3.4.4.7 SIGNAL CONDITIONING

No signal conditioning is provided, so the user must provide as necessary.

3.4.5 CONNECTORS

Table 3.4.5-1 lists connectors used in the exterior trailer interfaces and recommended compatible GSE connectors.

TO/FROM ROOM 104

Service Connector	Interface Location	Facility Cable Type	Facility Connector	Recommended Mating
J55 Umbilical	4950A1-4951A1 J57-J81	BL784	79K28234 UG493A/U	22275
J67 Umbilical	4950A1-4951A1 J109-J126	BL784	79K28234 UG493A/U	22275
J69 Umbilical	4950A1-4951A1 J127-J144	BL784	79K28234 UG493A/U	22275
J55 Umbilical	4950A2-4951A2 J1-J2	60(60#20)OS	MS3474L24-61P	MS346L24-61S
J74 Umbilical	4950A2-4951A2 J10-J12	4(4#4)OS	MS17347R-32N-17P	MS17344R-32N-17S
J74 Umbilical	4950A2-4951A2 J13-J22	TWC-124-2	79K28234	22275
J74 Umbilical	4950A2-4951A2 J23-J26	RG59/U	UBJ96-2	UTNN1
Instrumentation	4955 J10	40(20PTSI#16)OS	HKOOL40-81P(403)	HK06L40-81S
Instrumentation	4955 J11	60(60#16)os	HKOOL40-81P(403)	HK06L40-81S

(NOTE: panel 4926 connects to 4950 and panel 4949 connects to 4951)

TO/FROM FACILITY COMMUNICATIONS

Telephone	4950A2-4951A2 J33	60(60#20)OS	MS3474L24-61P	MS3476L24-61S
OIS	4950A2-4951A2 J34-J35	Not Used		
P/AW	4950A2-4951A2 J36	4(4#4)OS	MS3112E14-5P	MS3476L14-5P
S-Band	4956A1 J1-J5	FSJ4-50B	KN-99-14 (N Series)	M39012/01
Wideband	4956A2 J1-J7	WECO 754E T-43	79K28234(UG493A/U)	22275
Wideband	4956A3 J1-J3	WECO 754E T-43	1-331495-0	22275
Audio/Data	4956A3 J4	MSFC-SPEC 332/77 40(20 PTSI#20)OS	MS3474L24-61S	MS3476L24-61P
Telephone	4956A3 J5-J7	Alpha #32334 (4#20)OS	MS3110P10-6S	MS3456L14S-7P
Timing	4956A4 J1-J3	MSFC-SPEC 2(2#20)OS	TBF-145-7PS	MS3476L14S-7P
Countdown	4956A4 J4-J6	MSFC-SPEC 2(2#20)OS	TBF-145-7PS	MS3456L14S-7P
TV/Mon	4956A5 J1-J3	RG11A/U	UG414A/U	UG-959A/U
Control Switch	4956A5 J4	Beldon 87258 (4PT SI#20)	MS3119E12-10C	MS3476L12-10P
Control Switch	4956A5 J5	Beldon 93284 (2PTSI#22)	MS3119E10-98C	MS3476L10-98P
OIS	4956A6 J1-J7	Not used		
Paging	4956A7 J5-J7	MSFC-SPEC	88-323020-4S	88-323620-4P

Table 3.4.5-1 Table of connectors - exterior trailer interfaces

TO/FROM HIGH BAY

Instrumentation	4955 J1-J6	MSFC-SPEC 332/109 40/20 (PTSI#i161)OS	HKOOL40-81P	HKO6L40-81S
Instrumentation	4955 J7, J8	MSFC-SPEC 332/109 60(60#16)OS	HKOOL40-81P	HKO6L40-81S
Instrumentation	4955 J9	MSFC-SPEC 332/109 4(4#0)OS	HKOOL40-75P	HKO6L40-75S

Table 3.4.5-1 Table of connectors - exterior trailer interfaces (cont'd)

APPENDIX A - VPF INTERCONNECT DESCRIPTION

1.0 PATCH DISTRIBUTOR INTERFACE

Mission-shared racks 4925 and 4935 are used for interfacing control and discrete voltages with the user GSE, the payload, and KSC telephone landlines (See Figure A.1-1). The racks contain a patch distributor for signal routing, a 28-V dc subsystem for distributing 28 V dc, and fuse panels. Fusing of control circuits will provide a safety factor for payload instrumentation in case of GSE component failures. A description of the six panels is as follows:

A. 4925A1, 4935A1.

There are 42-connector (61-pin) patch distributors; 31 jacks are actually used. Jacks J26, J27, J33, J34, J35, and J30 are connected to jacks J1 through J6, respectively, on panel 4926A5. Six jacks (J23, J24, J25, J31, J32, and J36) are connected to telephone landlines. Jacks J9 through J16 carry 28-V dc power, and jack J39 is connected to the return bus. Sensitive relay modules are connected to jacks J1 through J5 and J11 through J15. Fuse panels 4925A2 and 4925A3 are connected to jacks J6, J7, J19, and J20. Jacks J21 and J22 are connected to the simulated T-0 umbilical J58 and J55 interface. The patching will be unique for each mission, based on user requirements. Wherever possible, patching should be like-pin to like-pin (pin A to pin A, pin B to pin B, etc.).

B. 4925A2, 4935A2.

Fuse panels using 60 3-A fuses are 1/4-by 1-1/4-in pin-indicating ferrule fuses (Bussman type GBA). Other fuse values may be substituted by request.

C. 4925A3, 4935A3.

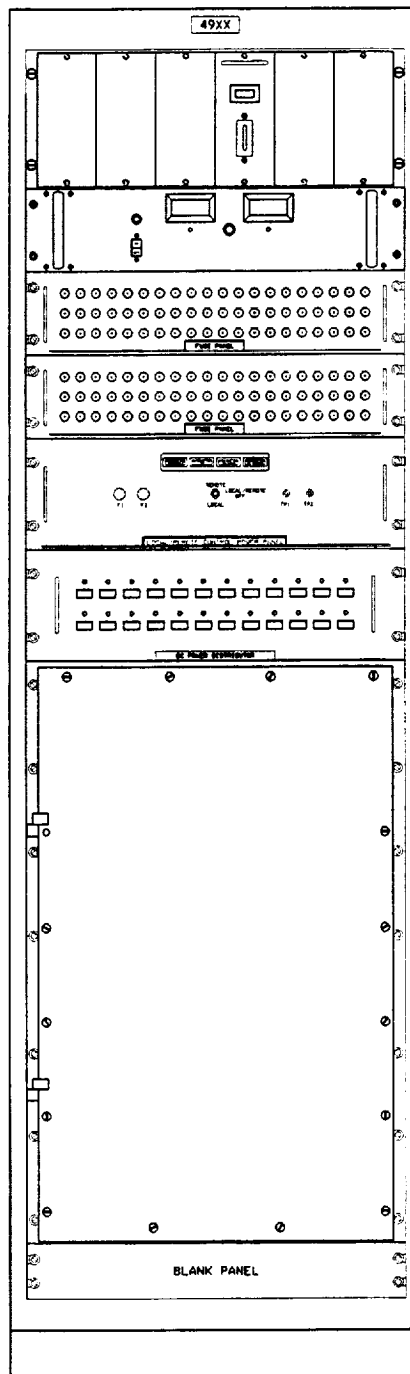
Same as panels 4925A2, 4935A2.

D. 4925A4, 4935A4.

Bus distributor panels are used to divide heavy-gage wire. A 2-conductor, No. 1/0 AWG cable from the power supply is broken out into 4 No. 8 AWG wires and 60 No. 20 AWG wires.

E. 4925A5, 4935A5.

These panels are used to break out 28-V dc power from two 2-conductor, No. 8 AWG cables to two 60-conductor, No. 20 AWG cables. Each group of four No. 20 AWG wires is routed through an indicating fuse holder normally supplied with a 5-A, 1/4-by 1-1/4-in pin-indicating ferrule fuse (Bussman type GLD). Other fuse values may be substituted by request.



4925 AND 4935 RACK ASSYS
PATCH DISTRIBUTORS
(FRONT DOOR REMOVED FOR CLARITY)

REF: 79K28873

FIGURE A.1-1 RACKS 4925 AND 4935

F. 925A6, 4935A6.

These panels are used to control the 28-V dc power supply. Front panel switches allow the operator to turn the power supply on and off locally or switch control to a hardware interface module (HIM) (not yet installed).

2.0 LPS CONTROL AND MONITOR INTERFACE.

The input/output (I/O) device for the LPS is a Hardware Interface Module (HIM). Commands to be sent to either the payload or its GSE are issued from the LPS consoles located in the Launch Control Center (LCC) Firing Rooms for the Pad, or from the CITE Control Rooms for the VPF. The commands are output from the HIM and forwarded to the payload or GSE. Monitoring of the payload or GSE is performed via a signal being sent to the HIM. The data is then processed and displayed at the LPS consoles. Connection to the HIM is performed via KSC performed patching internal to the T-0 System.

Each of the HIMs contains up to 30 I/O modules. There are a variety of I/O modules available that can be used to process different types of functions. Current complement of card types installed in the T-0 System HIM are as follows.

- a. Type A (8 channels, relay closure, 7 each)
- b. Type C (16 channels, 5 Vdc discrete input, 2 each)
- c. Type 2-D (16 channels, 28 Vdc discrete input, 3 each)
- d. Type 1-G (2 channels, 8 bit, 5 Vdc output, 2 each)
- e. Type K (4 channels, 5 to 5 Vdc analog output, 2 each)
- f. Type N (8 channels, 0 to 5 Vdc analog input, 2 each)
- g. Type S (4 channels, 0 to 50 Milli-Vdc input, 3 each)
- h. Type U-02 (8 channels, 10 to 30 Vdc analog input, 4 each)
- i. Type V (4 channels 0 to 5 Vdc analog input, 3 each)
- j. Type V-11 (4 channels 0 to 1.25 Vdc analog input, 2 each)

Card and channel use is assigned by KSC personnel based upon the users input to the LSSM. All channels are available for use except those dedicated to the 28 Volt DC subsystem.

The 28 Volt DC subsystem provides power for command stimulus (upon relay closure) and status activation is provided via the Accopian power supply located in Rack 4025 in the VPF. The power Source at the pad is power module 6822A8-3 located in the MLP compartment 7A. All outputs of the 28 Volt DC subsystem are fused with 5 Amp fuses. Lower fuse values may be substituted with prior notice to the LSSM.

3.0 USER GSE INTERFACE

Racks 4926 and 4949 are the mission-shared interfaced for all user GSE and provide access to the payload (See Figure A.3-1). The racks comprise five interface panels each, as follows:

A. 4926A1, 4949A1.

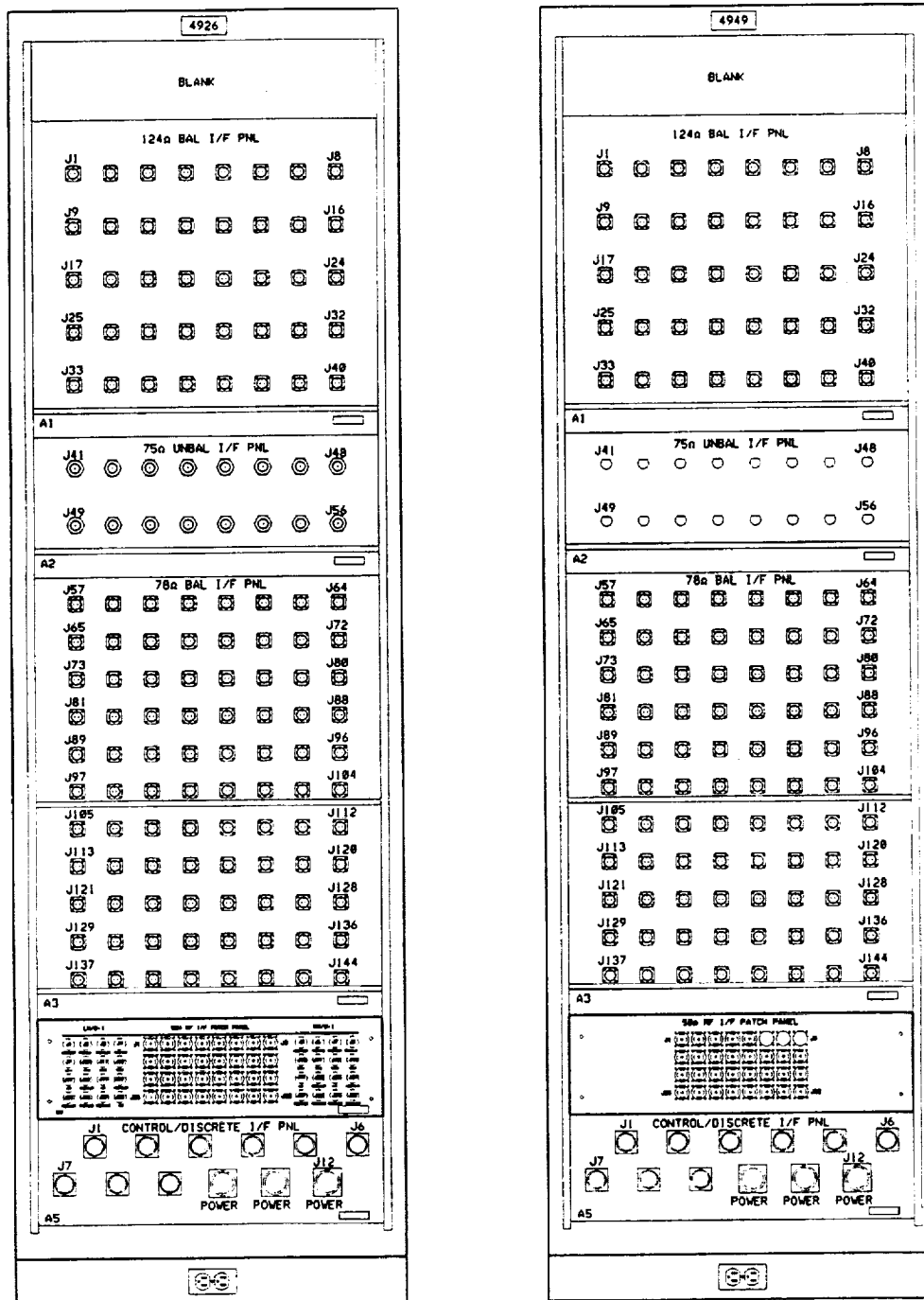
The 124-Ohm interface panels (A1) are primarily for those signals that are to be monitored remotely by use of the landline system. The cables in A1 panels are routed to the landlines interface rack where they can be patched to the KSC landline system, which interconnects the VPF with other facilities. Any telemetry data relayed by or generated by user GSE should begin from a 124 Ohm output and will interconnect in this field. The user must meet the landline electrical interface requirements as specified for wideband or data landlines.

The panels mount 40 Amphenol 82-5635 twin axial panel jacks, J1 through J40, and connects with panels 4928A2, 4928A4 from the 4926A1 panel; and panels 4928A16, 4928A17 from the 4949A1 panel via 124-Ohm impedance, balanced twin axial cable.

B. 4926A2, 4949A2.

The 75-Ohm interface panels (A2) are primarily for any 75-Ohm signals generated by user GSE. Neither the landline system nor the payload will accept a 75-Ohm unbalanced signal from the GSE. Minimum-loss pads are installed in the system interface to line-match the 75-Ohm unbalanced outputs of user GSE with the 50-Ohm precision helix subsystem. These pads have a bi-directional loss of 5.7 dB.

The A2 panel mounts 16 Trompeter UBJ26-2 BNC panel jacks, J41 through J56, and is connected to panels in 4927 via 75-Ohm impedance, unbalanced coaxial cable.



4926 AND 4949 RACK ASSY'S
USER GSE INTERFACE RACKS
(FRONT DOORS REMOVED FOR CLARITY)

FIGURE A.3-1 RACKS 4926 AND 4949

C. 4926A3, 4949A3

payload GSE and payloads in the test cell high bay (X sub 0 307 bulkhead) for twisted, shielded pairs (TSP's). The 78-Ohm balanced configuration is suggested for all payload GSE that interface with the payload.

The panels can mount 88 Amphenol 82-5635 twin axial panel jacks, J57 through J144, of which 66 jacks, J57 through J81 and J109 through J144, are used. These jacks are connected to panels 4927A1, 4927A2, 4927A4 from the 4926A3 panel; and 4927A9, 4927A10, 4927A11 from the 4949A3 panel via 78-Ohm impedance, balanced twin axial cable.

D. 4926A4, 4949A4.

The 50-Ohm interface panels (A4) are also a patch panel offering access to the radiating antennas on the roof of the VPF. High-frequency antenna tests can be configured on these panels. A4 also terminates helix circuits that begin in the cargo bay and 50-Ohm interconnecting cables from 4927. The panel serves as a coaxial patch panel for remotely transmitted unbalanced data and also as an interconnect for unbalanced data transmitted by user GSE in Room 104.

The panels mount 32 General Radio GR-0874-9451 feed through panel jacks, J1 through J32. Eight jacks, J9 through J16, are connected to the payload interface; and five jacks, J17, J19, J21, J23, and J28, are patchable to the S-band antennas on the roof via 50-Ohm impedance, unbalanced precision rf helix cable. The remaining 19 jacks are connected to panels 4927A5 and 4927A6 via 50-Ohm impedance, unbalanced coaxial cable.

E. 4926A5, 4949A5.

The control/discrete special power interface panels bring together the control and discrete signals originating in the payload or in the user GSE. The panels also provide an interface point for GSE-generated special power (dc and ac up to 70 A in parallel). Space is provided to mount nine Bendix PTB24-61PS thru-bulkhead connectors, although only six jacks, J1 through J6, are used. Sixty-conductor, No. 20 American wire gage (AWG) wire cable terminates these jacks, which present their pin side to the user interface. The special power receptacles, J10 through J12, are Bendix 10-194432-17PS thru-bulkhead connectors terminated with 4-conductor, No. 4 AWG wire cable and with the socket side presented at the user interface.

User GSE in Room 104 will interface only with the mission-shared panels in racks 4926 and 4949. Cabling for interconnecting GSE and GSE interface will be provided by the user. For any mismatch, whether mechanical or electrical, that cannot be rectified by the designed capability of the system interface and its accessories, the user must:

- a. Provide the necessary adapters that meet KSC standards.
- b. Provide a black-box device that is compatible with the electrical interface in 4926 or 4949, or both.

Users are cautioned to avoid using a multiconductor cable containing more than one kind of cable for GSE system outputs, unless that cable has a designed breakout that is compatible with racks 4926 and 4949, the GSE interfaces.

Also available for use are the payload user adapter boxes, drawing number 79K21433 or 79K27539. They may be connected to the 4926A5 or 4949A5 control/discrete interface plate with the supplied 6-ft cable and used to convert from a 61-pin connector to two 32-pin connectors, or from a 61-pin connector to four 61-pin connectors. The user should design his or her GSE to use this 32-pin connector configuration when it will satisfy his or her requirements.

4.0 ORBITER INTERFACE

Rack number 4927 is the mission-shared payload interface for wideband circuits (See Figure A.4-1). This rack contains two patch fields: a 78-Ohm balanced field, panels A1 through A4, A7, and A9 through A11; and a 75/50-Ohm unbalanced field, panels A5 and A6.

The 78-Ohm balanced field terminates the 78-Ohm inputs of the data-line matching coils in 4928, the 78-Ohm balanced data lines from the payload, and the 78-Ohm interconnecting cables from the user GSE interface. All of the cables terminating in the 78-Ohm patch field are balanced twin axial.

The 75/50-Ohm unbalanced patch field is primarily for analog video signals, digital video, unbalanced digital serial data, and unbalanced line matching between 50- and 75-Ohm coaxial cable. Cable terminations include the 50-Ohm inputs to the data-line matching transformers in 4928, 75-Ohm inputs to the dataline matching transformers in 4928, 75- to 50-Ohm minimum-loss pad inputs, and 75- and 50-Ohm interconnecting cables from the GSE interface.

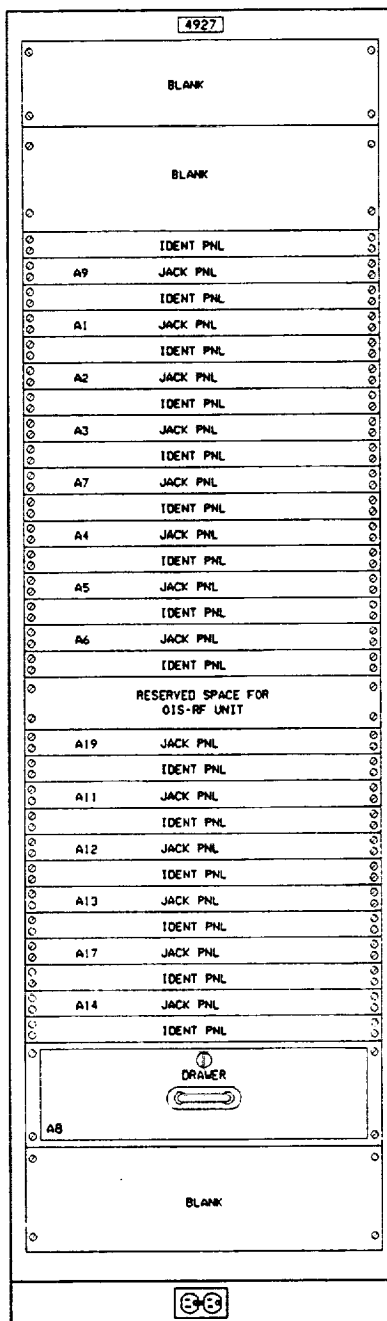
Each of the 10 interface panels within this rack can mount 52 jacks. The description of the individual panels is as follows:

A. 4927A1.

This panel is used to route wideband signals between the payload and the user interface in rack 4926. Jacks J1 through J18 connect to the simulated T-0 umbilical J69 interface. Jacks J27 through J44 are cabled to the 78-Ohm user interface panel 4926A3, jacks J127 through J144, respectively. Only 29 jacks are mounted; jacks J19 through J26 and J45 through J52 are not used. All connections are via 78-Ohm balanced twin axial cable.

B. 4927A2.

This panel is used to convert wideband signals from 78- to 124-Ohm balanced twin axial cable for transmission over the wideband landlines. Jacks J1 through J26 are cabled to the corresponding jacks on panel 4928A2 in the landline interface rack 4928. The even-numbered jacks (J2 through J26) are cabled directly; the odd-numbered jacks (J1 through J25) are cabled through 78/124-Ohm matching transformers C1 through C13. Jacks J27 through J51 are cabled to the 78-Ohm user interface panel 4926A3, jacks J57 through J81, respectively. Jack J52 is not mounted. All connections are via 78-Ohm balanced twin axial cable.



4927 RACK ASSY
ORBITER INTERFACE
(FRONT DOOR REMOVED FOR CLARITY)

REF: 82K28873

FIGURE A.4-1 RACK 4927

C. 4927A3.

This panel is used to route wideband signals to and from the payload via 78-Ohm balanced twin axial cable. Jacks J1 through J25 connect to the simulated T-0 umbilical J59 interface as marked. Jacks J27 through J51 are connected in parallel to the corresponding jacks (J1 through J25) above, allowing the signals to be monitored. Jacks J26 and J52 are not mounted. All connections are via 78-Ohm balanced twin axial cable.

D. 4927A4.

This panel is used to route wideband signals to and from the payload via 78-Ohm balanced twin axial cable and patch them to the user interface rack 4926. Jacks J1 through J18 connect to the simulated T-0 umbilical J67 interface and jacks J19 through J26 are not used. Jacks J27 through J44 allow patching to the 78-Ohm user interface panel 4926A3, jacks J109 through J126, respectively. All connections are via 78-Ohm balanced twin axial cable.

E. 4927A5.

This panel routes signals to and from the 75-Ohm user interface panel 4926A2 and also performs impedance matching from 50-Ohm unbalanced coaxial cable to 124-Ohm balanced twin axial cable. Only 32 jacks are mounted. The odd-numbered jacks (J1 through J15) are cabled to the 75-Ohm user interface panel 4926A2, jacks J41 through J48, respectively, using 75-Ohm unbalanced coaxial cable. The odd-numbered jacks (J27 through J41) are cabled to the 50-Ohm user interface panel 4926A4, jacks J1, J18, J3, J20, J5, J22, J7, and J24, respectively. The even-numbered jacks (J28 through J42) are connected in parallel to the corresponding jacks (J2 through J16) above to allow the signal to be monitored and are cabled to the landline interface panel 4928A4, jacks J7 through J14, respectively, via 50/124-Ohm impedance-matching transformers C20 through C27. All connections are via 50-Ohm unbalanced coaxial cable, except as noted.

F. 4927A6.

This panel performs 50/75- and 75/124-Ohm impedance matching and allows patching to the 124-Ohm landline interface panels and the 50- and 75-Ohm user interface panels. Only 40 jacks are mounted. The odd-numbered jacks (J1 through J11, J14, J17, and J20) are cabled to the corresponding jacks (J27, J29, J31, J33, J35, J37, J40, J43, and J46) below through a bi-directional 75/50-Ohm loss pad. The remaining jacks on the top row (J2 through J19) are cabled to the 50-Ohm user interface panel 4926A4 (jacks J2, J4, J6, J8, J25, J26, J27, J29, J30, J31, and J32, respectively). The even-numbered jacks (J28 through J38, plus J41 and J44, are cabled to the 75-Ohm user interface panel 4926A2, jacks J49 through J56, respectively. The remaining jacks, J39, J42, and J45, are cabled to the landline interface panel 4928A4, jacks J15, J16, and J17,

via 75/124-Ohm impedance-matching transformers C28, C29, and C30. All connections are either by 50- or 75-Ohm unbalanced coaxial cables as indicated.

G. 4927A7.

This panel performs 78/124-Ohm impedance matching to the landline interface rack. Only six jacks are mounted. Jacks J1 through J6 are cabled to the corresponding jacks on the landline interface panel 4928A4 via 78/124-Ohm impedance-matching transformers C14 through C19.

5.0 LANDLINE INTERFACE

Rack number 4928 contains the mission-shared KSC landline interface. This rack contains a patch field and matching transformers. The matching transformers are bi-directional and provide the following line matching:

- a. 124-Ohm balanced twin axial cable to 78-Ohm balanced twin axial cable (19 lines)
- b. 124-Ohm balanced twin axial cable to 75-Ohm unbalanced coaxial cable (3 lines)
- c. 124-Ohm balanced twin axial cable to 50-Ohm unbalanced coaxial cable (8 lines)

The coils are bridged between patch fields in rack 4928 and patch fields in rack 4927; i.e., the 124-Ohm inputs (outputs) of each coil are terminated in the 124-Ohm patch field in rack 4928, while the 50- 75-, and 78-Ohm outputs (inputs) are terminated in the corresponding patchfields in rack 4927. Other lines that terminate in the 124-Ohm patch field are:

- a. Wideband landlines consisting of wideband uplinks (WBUL's) to, and wideband downlinks (WBDL's) from the VPF that are equalized video lines connecting the VPF to other facilities for electrical interface specifications of the wideband landlines.
- b. Data landlines consisting of data uplinks (DUL's) to the MLP and data downlinks (DDL's) from the VPF that are digital data lines for transmission of command and telemetry signals between the VPF and other facilities.
- c. GSE inter-rack cables from the payload GSE interface panel 4926A1 to allow GSE access to the KSC landlines in rack 4928.

The wideband and digital lines are 16 PEV-L buried cable routed through the O&C Building to the Communications Distribution and Switching Center (CDSC) on KSC. From there, the signals can be relayed to other facilities on base, the Eastern Test Range, Goddard-Merritt Island (G-MIL)/ Spaceflight Tracking and Data Network (STDN), and Bell Telephone Company landlines.

All connections are via 124-Ohm balanced, shielded, twisted-pair twin axial cable, except as noted. Panels 4928A1 through 4928A4 can mount 52 jacks each. The description of the individual panels is as follows:

A. 4928A1.

This panel is used to patch 124-Ohm balanced signals downlink from the payload to remote sites. Only 24 jacks are mounted. Jacks J1 through J8 and J16 through J19 are connected in parallel to the corresponding jacks in the bottom row (J27 through J34 and J42 through J45) to provide monitoring capability and are cabled to the wideband patch panel in terminal distributor 4989 as marked. The first set of jacks is allocated for eight 256-kb/s DDL channels and the second set for four WBDL channels.

B. 4928A2, 4928A16.

These panels receive 78- and 124-Ohm balanced signals for patching. Jacks J1 through J26 are cabled to the corresponding jacks on the 78-Ohm user interface panel 4927A2. The signals on the odd-numbered jacks (J1 through J25) have been impedance matched to 124-Ohm balanced twin axial cable; on the even-numbered jacks (J2 through J26), they have not. Jacks J27 through J52 are cabled directly to the 124-Ohm user interface panel 4926A1, jacks J1 through J26, respectively.

C. 4928A3.

This panel is used to patch 124-Ohm balanced signals from remote sites to the payload. Only 14 jacks are mounted. Jacks J1 through J3 and J14 through J17 are connected in parallel to the corresponding jacks in the bottom row (J27 through J29 and J40 through J43) to provide monitoring capability and are cabled to the wideband patch panel in terminal distributor 4989 as marked. The first set of jacks is allocated for three 256-kb/s DUL channels and the second set for four WBUL channels.

D. 4928A4, 4928A17.

These panels route 124-Ohm balanced signals to or from 50-, 75-, and 124-Ohm interface panels. Jacks J1 through J14 are cabled to wideband interface panel 4927A5 via bi-directional impedance-matching transformers: 124/78 Ohm for jacks J1 through J6 and 124/50 Ohm in the case of jacks J7 through J14. Jacks J15 through J17 are connected in parallel to jacks J41 through J43 in the bottom row to provide monitoring capability and are cabled to the wideband interface panel 4927A6 via 124/75-Ohm bi-directional impedance-matching transformers. Jacks J26 through J40 are cabled directly to the corresponding jacks on the 124-Ohm user interface panel 4926A1. Only 34 jacks are mounted.

E. 4928A5, 4928A14.

Panels 4928A5 through 4928A14 comprise the data-line matching subsystem. The seven panels, A5 through A11, each mount three 124/78-Ohm transformers with two transformers in panel A11 unused. Panels A12 and A13 each mount four 124/50-Ohm transformers. Panel A14 mounts three 124/75-Ohm transformers.

APPENDIX B - GSE DESIGN LESSONS LEARNED

The following is a list of problems which have been encountered during previous mission flows.

1. MOST COMMON PROBLEMS:

- a. Dissimilar cable types and characteristics (e.g., incompatible impedance values, etc.)
- b. Incompatible connectors both for payload to GSE signals and for facility AC power.
- c. Insufficient cable length to allow for planned GSE placement and cable routing.
- d. Damage to GSE due to sensitivity to rotation of three-phase facility AC power. KSC three-phase power has A-B-C rotation.

2. KSC OPERATIONAL CONSTRAINTS PROBLEMS:

- a. All connecting and disconnecting to and from VPF interfaces will be performed solely by KSC personnel. It is recommended that customers GSE have test points and patch fields for greater flexibility.
- b. GSE should be set up to have remote operation capability to allow for those periods of time where access will be denied.
- c. GSE should be manually portable or modular. Larger GSE requiring cranes or lifting equipment may be subject to many delays in being moved to test locations.

3. HAZARDOUS CONDITIONS PROBLEMS:

- a. All testing which involves or requires any level of rf radiation must be identified as hazardous and will require safety operations and coordination.
- b. In the event of an emergency, immediate power down of GSE may be required in order to prevent further problems.

4. MISCELLANEOUS OCCURRENCES:

- a. Some GSE that was equipped with wheels for rolling into place had wheels that were too small to be rolled across the gratings which exist in some areas.
- b. GSE requiring grounding must provide ground strap and mounting hardware.
- c. GSE should be rugged enough to withstand vibrations which may be encountered during transportation.
- d. Facility AC power may be subject to glitches and transients due to uncontrollable factors. The GSE should be insensitive to this or be able to compensate for the anomalies.
- e. GSE racks that are to be mounted into the VPF, require a method for removing wheels and/or dollies and securing to the floor mounts that are provided.
- f. To avoid potential damage to GSE, it is recommended that the ability to verify, monitor and disconnect input power at the GSE be provided.
- g. If timing is required to the GSE for event recording or other purposes, a timecode generator should be provided with the GSE.

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APPENDIX C - FREQUENCY RESPONSE DATA (TYPICAL)

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<u>CIRCUIT</u>	<u>INSERTION LOSS</u>			
	<u>1 KHz</u>	<u>100 KHz</u>	<u>1 MHz</u>	<u>5 MHz</u>
<u>MLP 10 A to SIP</u>				
J59	-3 db	-1.0 db	-2.6 db	N/A
J67	-3 db	-1.0 db	-2.6 db	N/A
J69	-5 db	=1.0 db	-2.5 db	N/A
<u>PTCR 220 to SIT</u>				
J59	0.2 db	-1.8 db	-8.2 db	-2.3 db
J67	N/A	N/A	N/A	N/A
J69	N/A	N/A	N/A	N/A
<u>PTCR 220 to MLP 10A</u>				
J59	-6 db	N/A	N/A	N/A
J67	N/A	N/A	N/A	N/A
J69	N/A	N/A	N/A	N/A
<u>PTCR 220 to PCR</u>				
J59	N/A	N/A	N/A	N/A
J67	N/A	N/A	N/A	N/A
J69	N/A	N/A	N/A	N/A
124 Ohm	-5 db	-6 db	N/A	N/A
<u>PTCR 220 to Pad Surface</u>				
124 Ohm	N/A	N/A	N/A	N/A

TABLE C-1 FREQUENCY RESPONSE DATA (TYPICAL)

DATA COLLECTED BY RUNNING BOOK OMI E2530
NOTE: IF DATA IS NOT AVAILABLE, N/A IS ENTERED

APPENDIX D - SYSTEM ENGINEERING DRAWINGS

Drawing Number	Title (Description)
79K16210	Standard Interface Document (VPF)
79K28873	Fabrication T-0 Umbilical VPF CITE Payload and GSE Systems
79K28874	Installation T-0 Umbilical VPF CITE Payload and GSE Systems
79K28875	O & M T-0 Umbilical VPF CITE Payload and GSE Systems

TABLE D-1 SYSTEM ENGINEERING DRAWINGS